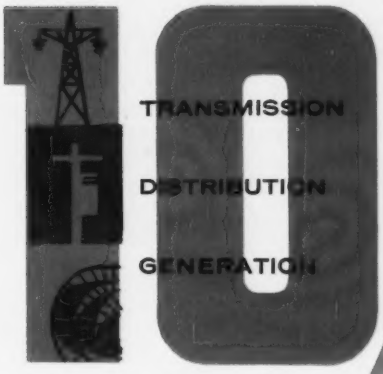
The Electrical Industry's Weekly Magazine September 14, 1959

Electrical World

Price One Dollar

A McGraw-Hill Publication



10th annual electrical industry

FORECAST 1959 1975

POPULATION AND INCOME p 98
RESIDENTIAL KWHR SALES p 101
INDUSTRIAL KWHR SALES p 105
INDUSTRIAL PRODUCTION p 103
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UTILITY CAPITA[illegible] p [illegible]

UNIV MICROFILMS INC
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Where Texaco shatters costly ideas

The old idea that lubrication is just maintenance routine is breaking up like old-type grease under the speaker's gavel.

Here at the Texaco Research Center in Beacon, N. Y.—largest such facility—Texaco Lubrication Engineers learn the latest in lubricant technology and *how to apply it* as a major factor in cost control.

Thus, they can help your maintenance and operating people apply the principles of Organized Lubrication to reduce your costs.

Send for our book: "Management Practices that Control Costs via Organized Lubrication."

Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. EW-91.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

Electrical World

Vol. 152, No. 11 SEPTEMBER 14, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

CURRENT EVENTS

Teamwork Tames Rockslide Threat

Army Engineers direct big earth-moving operation to cut spillway in Montana pile-up caused by earthquake.....p 90

MANAGEMENT NEWSLETTER

Utility Executives' Pay Is Catching Up

Contrary to all industry experience, 39-company survey shows compensation rose 5.9% in 1958, a recession year..p 165

Special Report

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th annual electrical industry

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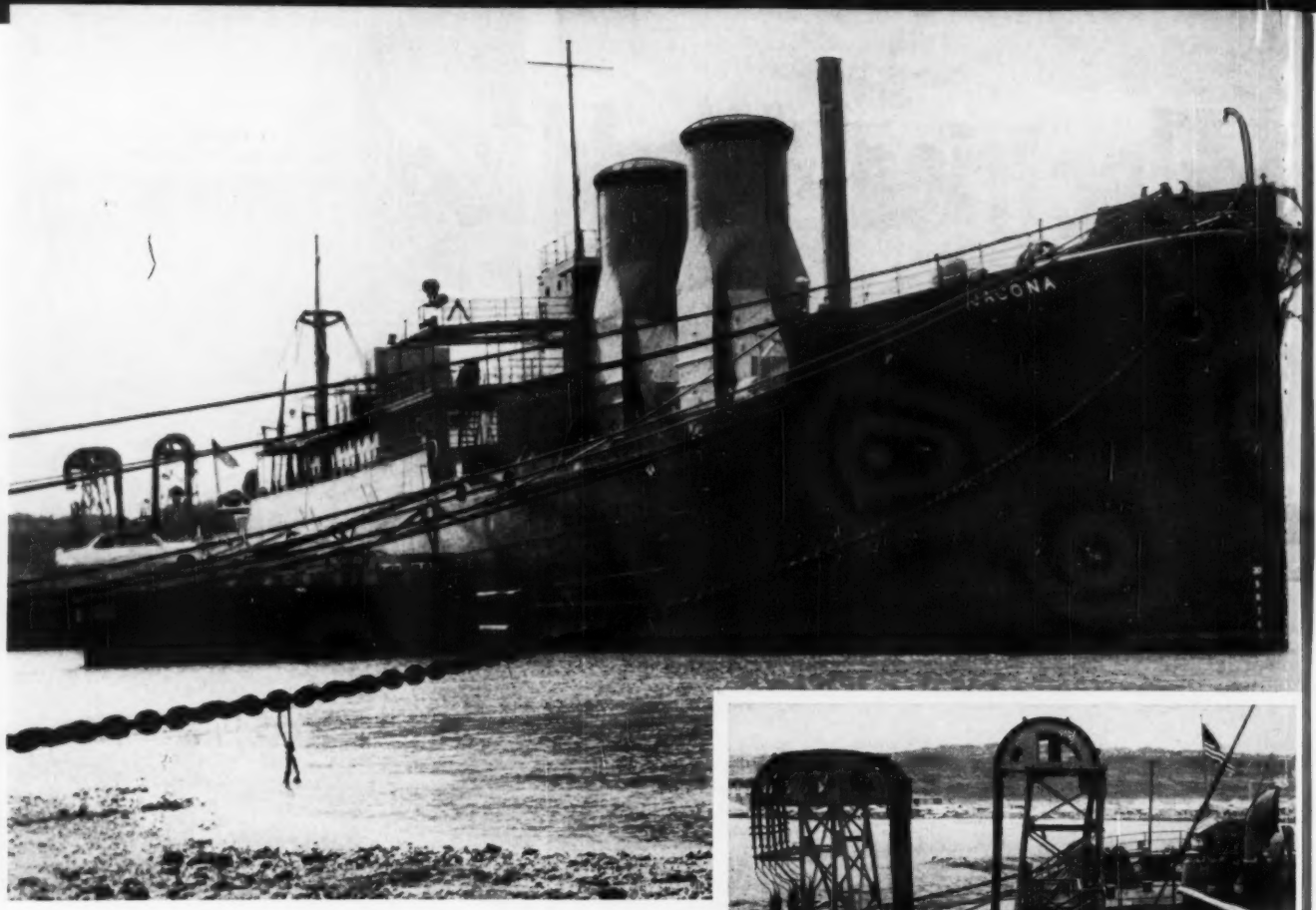

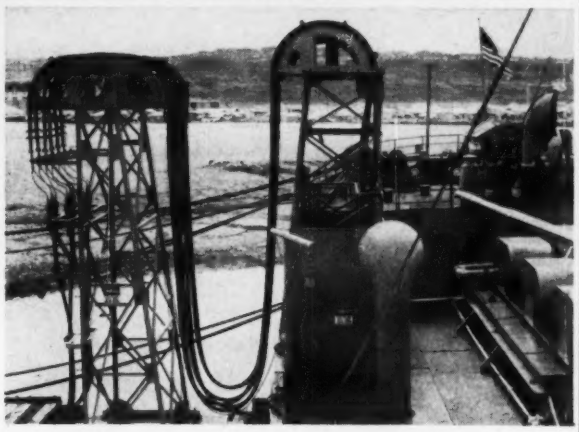

20,000 KW of power, on a standby basis, are always reliable from the floating power barge Jacona, anchored off the island of Okinawa. Okonite cables form the ship-to-shore link. The permanent Okinawa generating system provides power for normal requirements. However, reliable standby generation is required for scheduled and unscheduled equipment outages. As a result, the dependable Okonite cables have frequently been pressed into service. Gilbert Pacific, Inc., subsidiary of Gilbert Associates, Inc. of Reading, Pa., which operates the generating and transmission system for the U. S. Army, reports service to date—from 1956—has been perfectly satisfactory.

Backstop for Okinawa power supply

Standby power for the entire island of Okinawa is generated on a floating barge and flows at 13.2kv through six 80-foot lengths of Okonite cable. Constructions used are 1/c, 1,000 MCM, strip-insulated, extra-flexible cables, complete with factory-made stress cones and terminal fittings. Since the cables have a large, air-suspended loop, they have a seine twine reinforcement within the extra-heavy Okoprene sheath for increased longitudinal strength.

Use of Okoprene spotlights its unusual protection against weather, chafing, constant flexing, heat and cold, acids, alkalies and chemical attack. The installation itself provides an excellent demonstration of how unusual cable problems are solved by Okonite with its four safeguards of cable dependability:

1. Engineering experience, derived from developing long-lived cables for every type of application.

2. Quality materials, maintained without compromise for every component and through every stage of construction.

3. Manufacturing skill, achieved by 80 years' work with all known insulating methods.

4. Quality control, assured by the strictest, most thorough testing methods in the industry.

If you have a difficult cable job in mind, get in touch with Okonite. Let us help you now . . . while you're in the planning stages. Applying Okonite know-how . . . we might have an idea that will make the whole job easier, surer and longer lasting.

THE OKONITE COMPANY
Subsidiary of Kennecott Copper Corporation
Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

6909

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LETTERS

A Power Hitching Post?

To the Editor:

With reference to your Editorial note in the May 11th issue of Electrical World (page 5) entitled "Where Are the Brain Stormers?", I would like to submit the idea that, in view of the forthcoming popularity of the electrically powered automobile, parking meters all be wired with a battery charger. Thus, when your electric car is "at the hitching post" it will be recharged for you while you run your errands, and will be fully charged and ready to take off when you want to resume your journey.

P. W. Raymer
General Manager
International Operations

Montreal Engineering Company, Limited
Montreal 1, Canada

"Perfect Bind" vs Perforations

To the Reader:

Thanks very much for your comments on our experiment with "perfect binding" as opposed to perforations. Those avid readers who file individual pages of Electrical World have let us know, in no uncertain terms, of their preference. Initial response gave a slight nod to the "perfect bind." But there are mechanical difficulties to be solved before we can make any departure from our present perforations. We'll keep you informed on developments. Meanwhile, here is a sampling of the early responses to our experiment.

The Editor

To the Editor:

I am very much in favor of this new type of binding.

EF Hubbard
Des Moines, Iowa

Looks like best solution to satisfy everybody.

Tom Hoke
Oklahoma Gas & Electric Co.

No!

R. L. Bobo
Federal Pacific Electric Co.

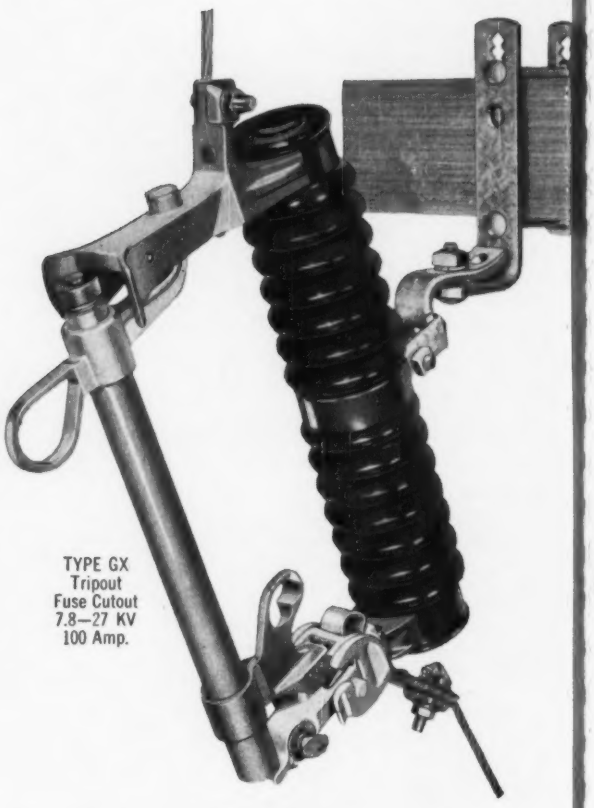
Is "perfect bind" better than perforations? Yes—oodles!

O. Ramsaur
Pennsylvania Power & Light Co

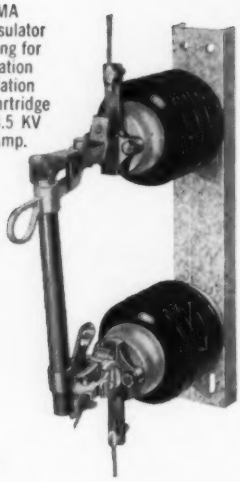
(*Continued on page* 181)

KEARNEY

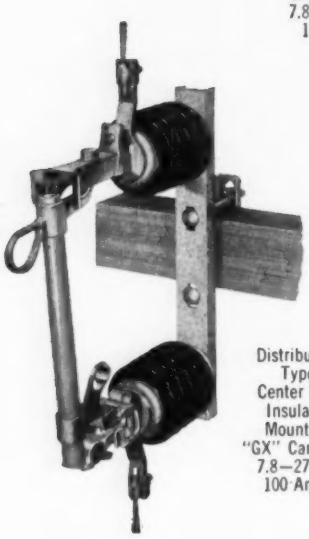
KEARNEY "G" and "GX"



TYPE GX
Tripout
Fuse Cutout
7.8—27 KV
100 Amp.

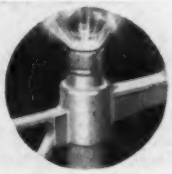


NEMA
Post Insulator
Mounting for
Substation
Installation
"GX" Cartridge
7.8—34.5 KV
100 Amp.



Distribution
Type
Center Bolt
Insulator
Mounting
"GX" Cartridge
7.8—27 KV
100 Amp.

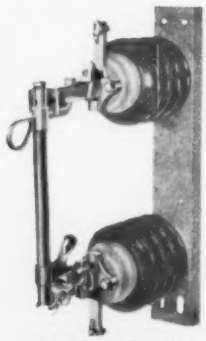
Type "GX" Cartridges vent at bottom only on low-amperage faults . . . at both ends on high fault currents. Both vents are in line with axis of tube, reducing shock recoil to a minimum. On high amperage faults, top venting action blows small disk out of expendable cap to safely relieve gas pressure.



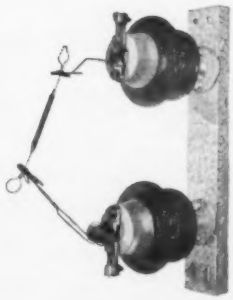
UPDATE YOUR OLDER CUTOUTS WITH KEARNEY CONVERSION UNITS.

These modern current-carrying parts install on existing mountings to give you all of the outstanding features and performance of the newest Kearney Cutouts—positive dropout action, higher interrupting capacity, and extra strength fuse tubes.

Type G 5.2-15 KV
Type GX 7.8-15 KV



Type G and Type GX
7.8-34.5 KV



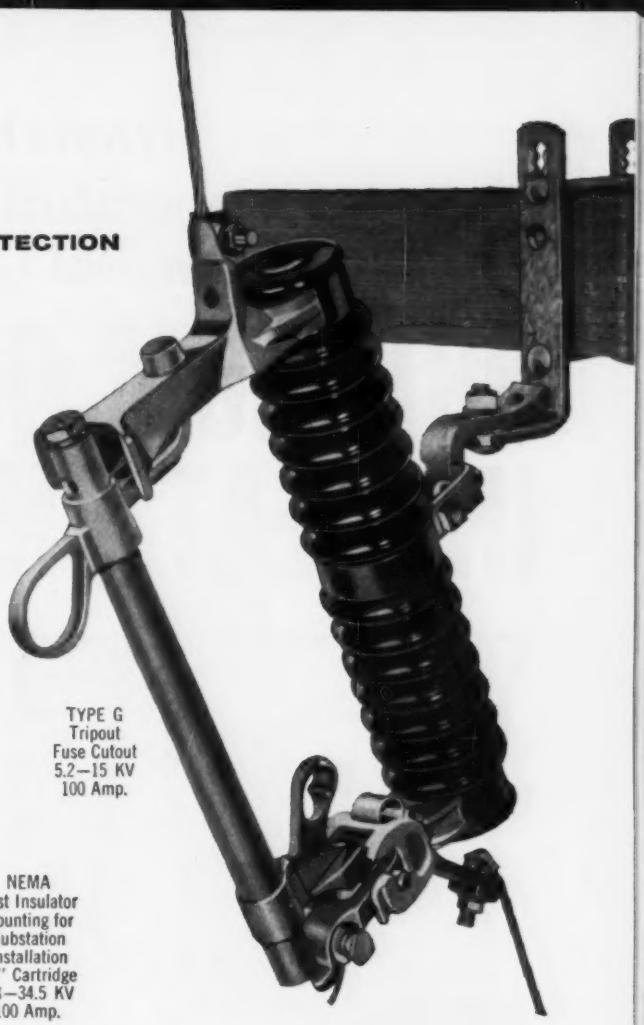
Trip-O-Link 50 Amp.
23-69 KV

for better construction – safer maintenance – specify KEARNEY products

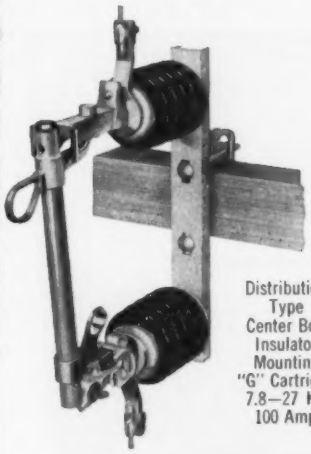
cutouts...

FOR DEPENDABLE, MODERN SYSTEM PROTECTION

Kearney Type "G" and "GX" Tripouts assure the highest level of operating dependability and economy for full range distribution system protection. Both interrupt fault currents ranging from minimum melting of the link to maximum rating of the cutout with any size button head link up to 100 amperes. A choice of venting is offered by two cartridge types, interchangeable in the same voltage ratings. Full-time double venting is provided by the "G"... and pressure-controlled double venting by the "GX." These two cartridges, and a wide range of interrupting ratings, voltages and mountings meet every operating requirement.



TYPE G
Tripout
Fuse Cutout
5.2—15 KV
100 Amp.



Distribution
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Insulator
Mounting
"G" Cartridge
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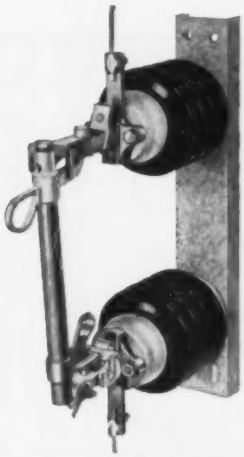
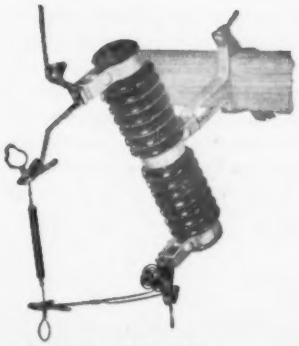
100 Amp.



NEMA
Post Insulator
Mounting for
Substation
Installation
"G" Cartridge
7.8—34.5 KV
100 Amp.

Front vent directs expulsion gases away from line equipment. Gas pressure from top jet keeps cartridge in place and upper contacts closed until arc is extinguished. Size of top vent in double vented cartridge allows build-up of ample pressure to extinguish low amperage arcs, yet enables cartridge to withstand gas force of high current faults without rupturing.

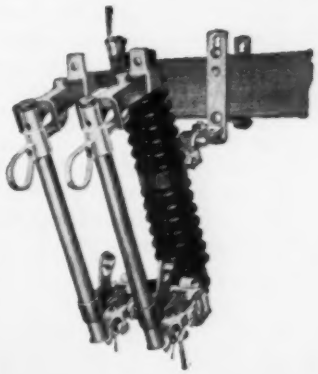
Heart of Type "G" construction is this full-floating constantly aligned upper contact, which cannot be misaligned by high current interruption or extreme side thrust during closing. During interruption, force of cartridge thrust is absorbed by full-floating contact until arc is extinguished and cartridge drops out.



Trip-O-Link 50-100 Amp.
5.2-15 KV

KEARNEY DUAL CARTRIDGE LOAD INTERRUPTER

Safe, positive way to interrupt load current. For full load sectionalizing or dropping transformer or capacitor banks. Current is interrupted electrically, not mechanically. During operation, one cartridge, fused for load protection, is closed in; the other, the interrupter, fused with a low amperage link, remains open. Later this cartridge is closed in, and service cartridge pulled out. After predetermined time delay, small link blows, interrupting current safely within interrupter cartridge.



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Plants at: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH AND CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

from the
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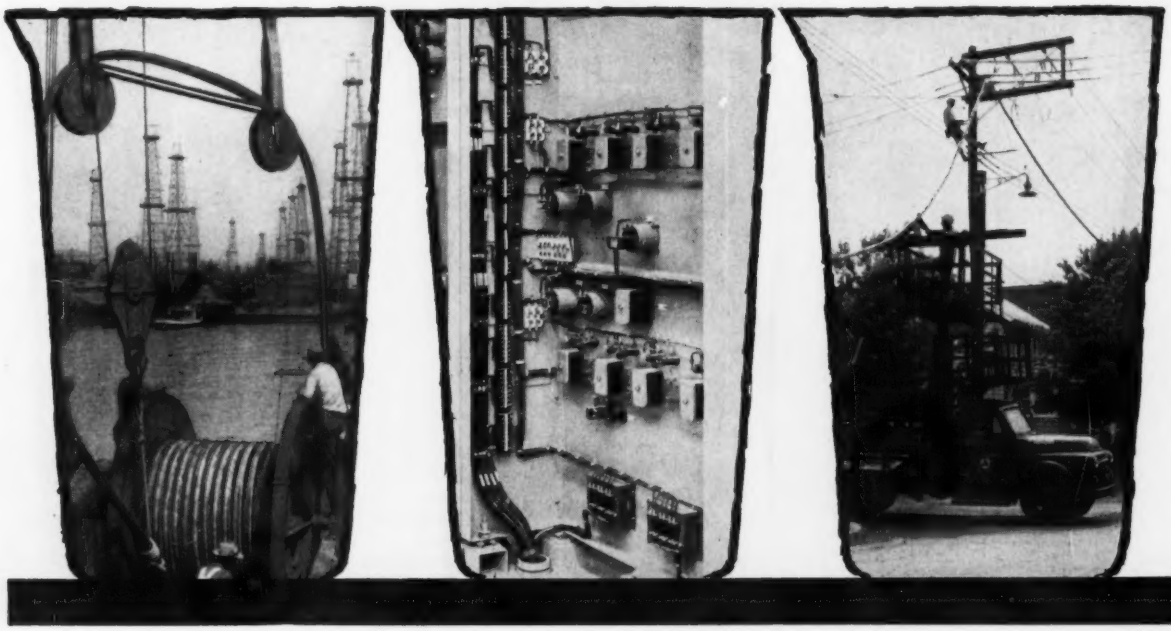
PREMIUM QUALITY INSULATION COMPOUNDS



AQUASEAL

low SIC, superior, rubber compound that is heat and water resistant, used on single and multiple-conductor cables at ratings up to and including 2KV a-c or d-c. Recommended for dry, alternately wet and dry, and continuously wet locations, subject to a-c or d-c potentials at either polarity, and at a maximum conductor temperature of 75C.

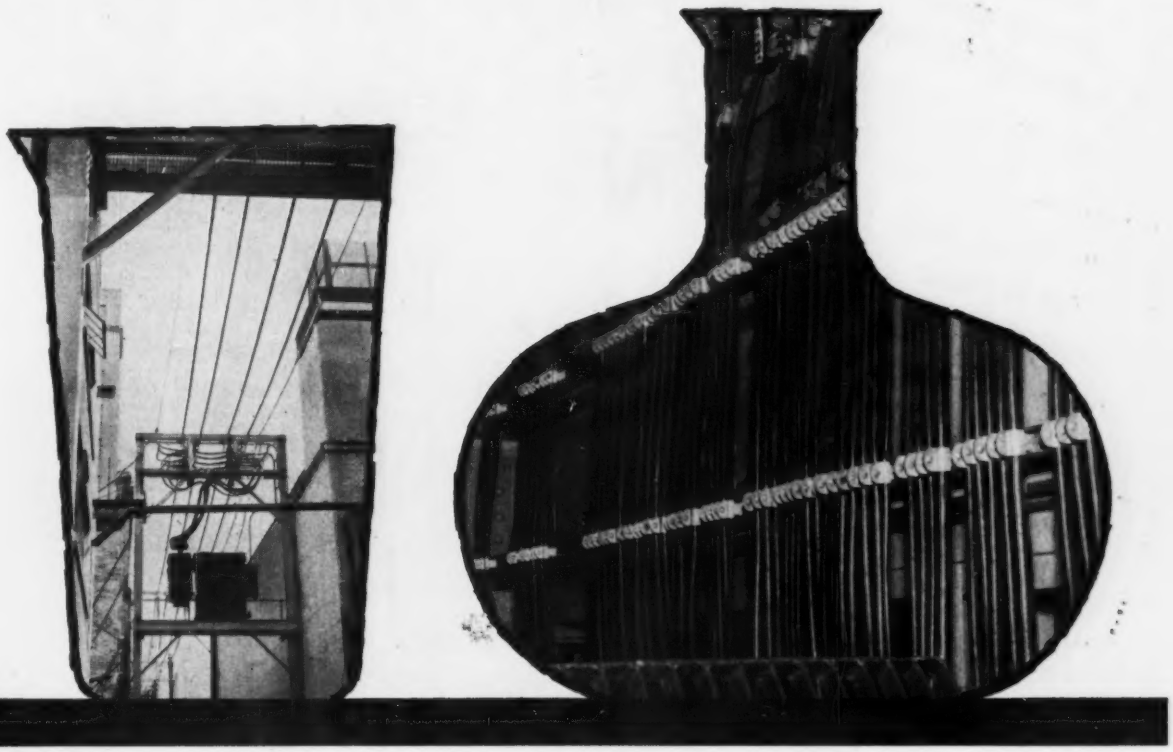
GENCORONE

high-voltage, ozone-resistant insulation of the oil base type, with exceptional physical and electrical stability. Resists the effects of moisture, sunlight, weather and earth solutions. Permits liberal current ratings consistent with maximum continuous operating temperatures of 75C for 8KV service or lower and 70C for higher voltages.

BUTARONE

high-voltage, butyl-base compound with exceptional resistance to ozone, low water absorption, and excellent resistance to heat. Suitable for both low and high-voltage applications, it has excellent electrical stability and resistance to aging. Operates at 90C up to 5KV and at 85C at higher voltages.

In the modern General Cable laboratories, some of America's foremost rubber chemists create, test and evaluate new insulation compounds in a continuous program of research and development. Materials for standard service conditions and special constructions to satisfy unusual requirements have all proven their worth in superior performance in power and control cables over many years. A few of the basic compounds from General Cable's long list are briefly described on these pages.



THERMAX-W

and many other compounds in the rubber group are available for low and moderate voltage power cable service in wet locations, where high temperatures are encountered or where high current carrying capacity is required.

GENCASEAL (PVC)

in the thermoplastic group, as well as high-molecular-weight polyethylene, which is another outstanding General Cable thermoplastic insulation.

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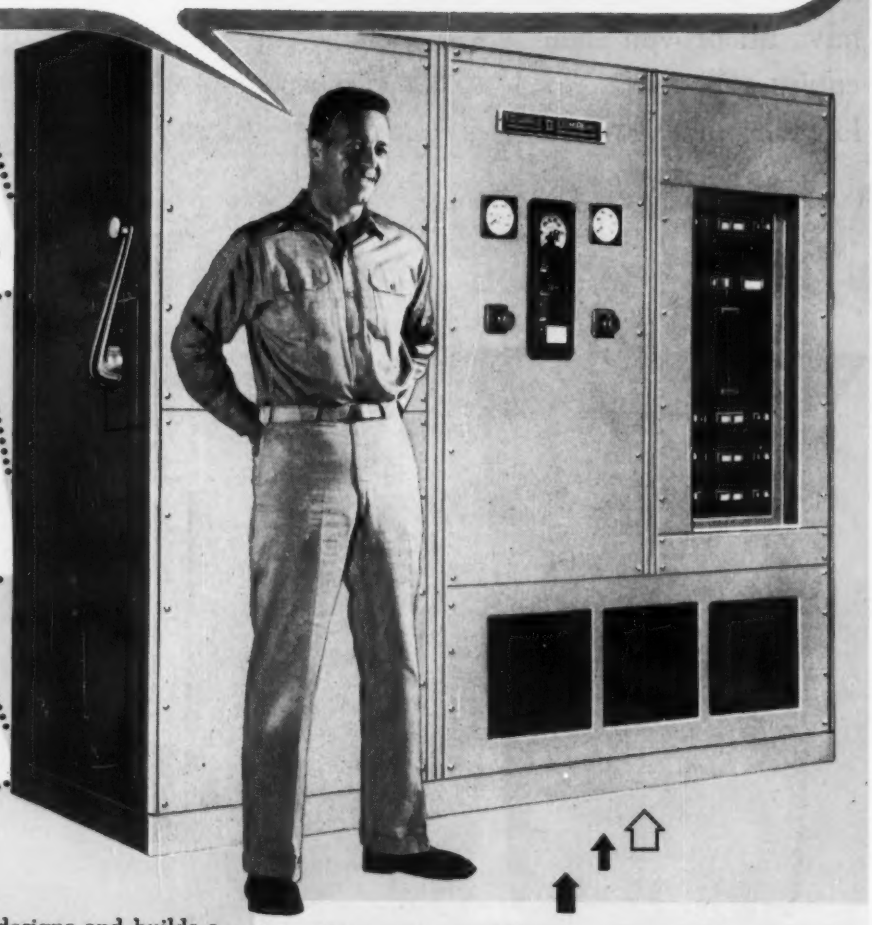
GENERAL CABLE CORPORATION, 730 Third Avenue, New York 17, N. Y.

for quality and service specify... GENERAL CABLE

Power-zOne UNIT SUBSTATIONS
HAVE EVERYTHING...INCLUDING COMPACTNESS!



Can be moved through normal commercial doorways

Save valuable space —can be placed against the wall

Capacities up to 300 KVA

• Square D designs and builds a complete line of substations for any application, indoor or outdoor—with dry or liquid-filled transformers—with large air-breakers or molded case breakers—with motor control units.

If you have any questions pertaining to substations, call in your Square D Field Engineer or write for literature describing space and cost saving with Square D's "*Power-zone*" design.

Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

Power-zOne DESIGN PAYS OFF!

MINIMUM SIZE AND EASY HANDLING

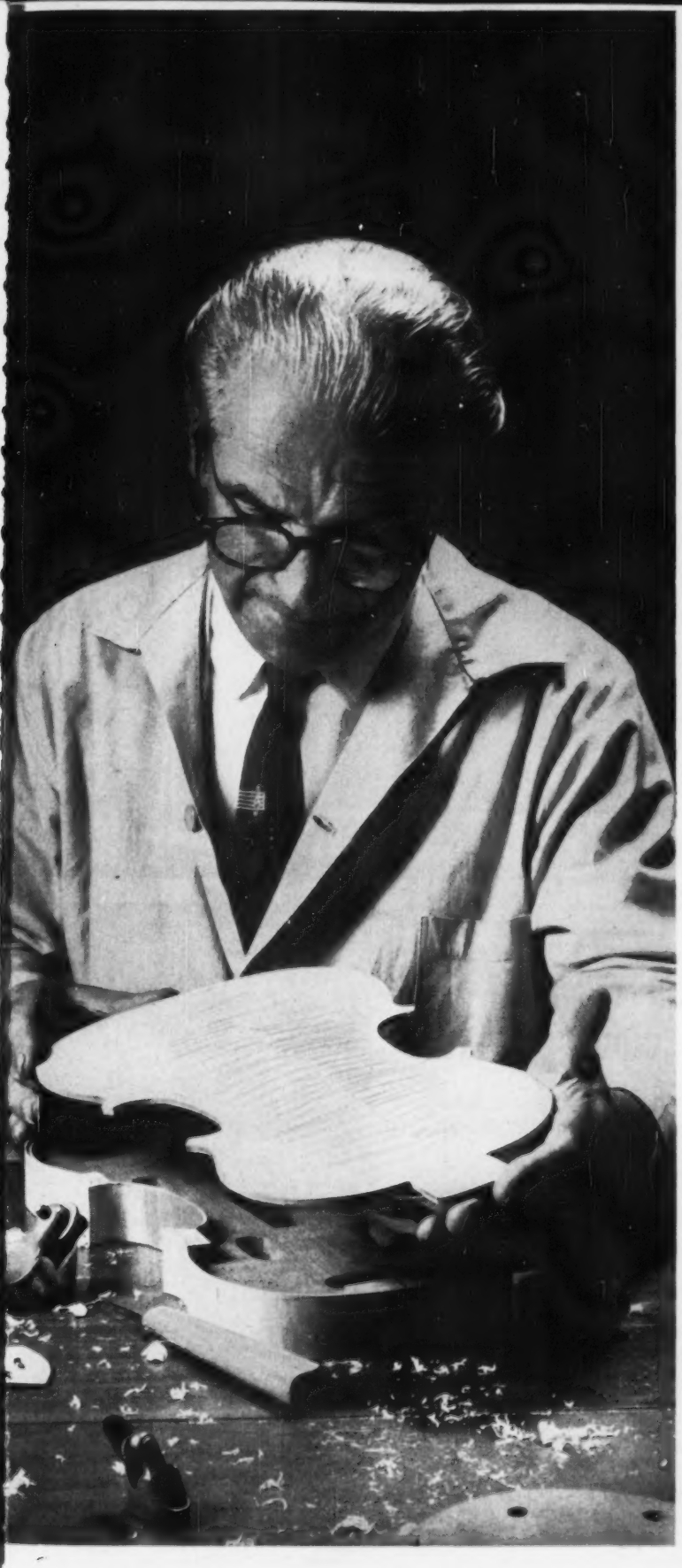
- Only 79½" high, 36" deep and 94" wide
- All components front-accessible

EQUIPPED TO BEST FIT YOUR APPLICATION

- **High Voltage** • Air interrupter switch or oil cutouts, fused or unfused
- **Transformer** • Dry type; quiet; up to 300 KVA and up to 5 KV primary; winding taps easily accessible through front grille
- **Low Voltage** • Molded case circuit breakers; QMB fusible switches and motor starters; metering equipment. Full 72" of panel space available for these devices

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



"When performance counts," says our artisan friend, "you look for skilled craftsmanship and the best materials. There can be no compromise with quality."

The same thing applies to treated wood products. At AMCRECO no detail is insignificant. Each step—from selection of growing timber to treatment of the wood—is carefully controlled for highest quality.

The results of this exacting care and craftsmanship are reflected in the decades of service-life that AMCRECO-treated structures provide.

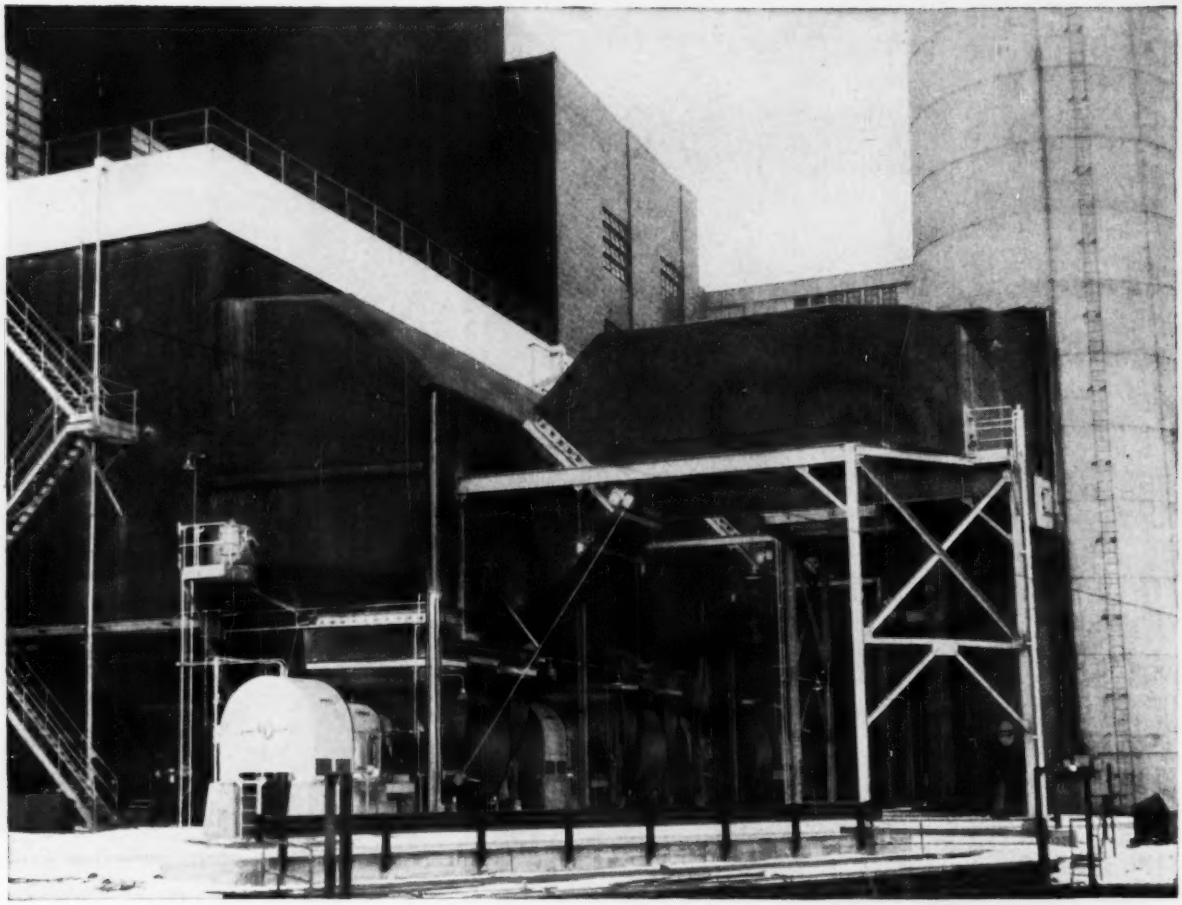
Why not see for yourself how quality control can improve performance, by specifying AMCRECO on your next order for pressure treated wood products.

AMERICAN CREOSOTING CORPORATION

AMCRECO PRESSURE TREATED WOOD PRODUCTS

Louisville 2, Kentucky

Subsidiary of Union Bag-Camp Paper Corporation



"Buffalo" Induced Draft Fans at Commonwealth Edison Company's Waukegan Station, Unit 7. Fans draw from a common precipitator plenum chamber and discharge into a common stack. Fans deliver 312,000 cfm at 21" S.P. at 300° F., have air cooled bearings. Engineered by Sargent and Lundy.

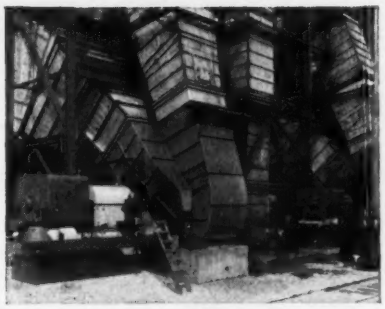
COMMONWEALTH EDISON COMPANY SELECTS "BUFFALO" FOR INDUCED DRAFT

The Commonwealth Edison Company has, over the years, purchased numerous "Buffalo" fans. This is a tribute to the performance, quality and long service life of "Buffalo" Products.

This same reliable performance and "Q" Factor Quality Construction is available to you in every "Buffalo" fan.

You are assured of getting the right fan for every job, too, since "Buffalo" offers a complete line of fan wheel types, each suited to a different set of circumstances.

The next time you need fans for any installation, large or small, be sure to phone your "Buffalo" Engineering Representative. He will have the best fan for the job and the experience necessary to see that it is recommended.



Installation photo, Commonwealth Edison Company's Will County Station Unit 3. This is one of four I. D. Fans now operating at 237,500 cfm at 15" S.P., 300° F. Engineered by Stone and Webster Engineering Corp.

Construction photo showing three of the four "Buffalo" I. D. fans at Commonwealth Edison Company's Fisk Street Station. These fans are now each operating at 362,300 cfm at 23.2" S.P., 325° F. Engineered by Bechtel Corp.

BUFFALO FORGE COMPANY
Buffalo, N. Y.
Buffalo Pumps Division Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING
FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

ONE SURE SOURCE OF SUPPLY

for all your wire and cable needs

Working through a Circle distributor is good business for wire and cable users. Reasons: quality products, reliability of supply, all-out service.

Take *quality*, for example! It's a built-in plus in every Circle product—from the basic metals mined and refined by Circle's own parent company, Cerro de Pasco, right down to the finished wire and cable—all the result of a business philosophy of producing products which far surpass minimum requirements.

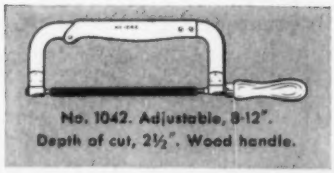
The same goes for supply and service. Circle users know that nearby completely stocked warehouses can usually take care of their needs. And when they can't, they know a simple telephone call by their distributor to the plant will get the fast action they want.

So why don't *you* make a Circle distributor your "one sure source of supply"—many other satisfied customers do.

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. SALES OFFICES & WAREHOUSES: in all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

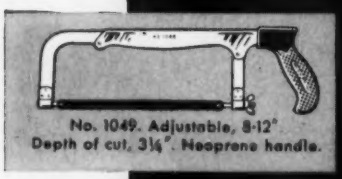


No. 1042. Adjustable, 8-12". Depth of cut, 2½". Wood handle.

CRESCENT HACKSAWS

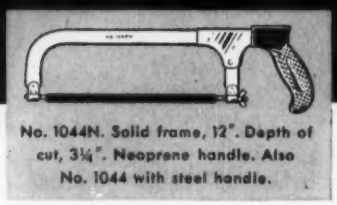
have what it takes

No. 1046. Adjustable, 8-12". Depth of cut, 2½". Steel handle.



No. 1049. Adjustable, 8-12" Depth of cut, 3¼". Neoprene handle.

NO. 1047. ADJUSTABLE, 8-12". DEPTH OF CUT, 3¼". STEEL HANDLE.



No. 1044N. Solid frame, 12". Depth of cut, 3¼". Neoprene handle. Also No. 1044 with steel handle.

Strong, rigid, well-balanced Crescent Hacksaws are designed for the exacting mechanic. Choose from five popular patterns having wood, steel or Neoprene handles and nickel or chromium plate finish. The Neoprene handles are far superior to plastic. They are impervious to oil and acid, unaffected by extremes of heat or cold, have high dielectric value and are practically unbreakable.

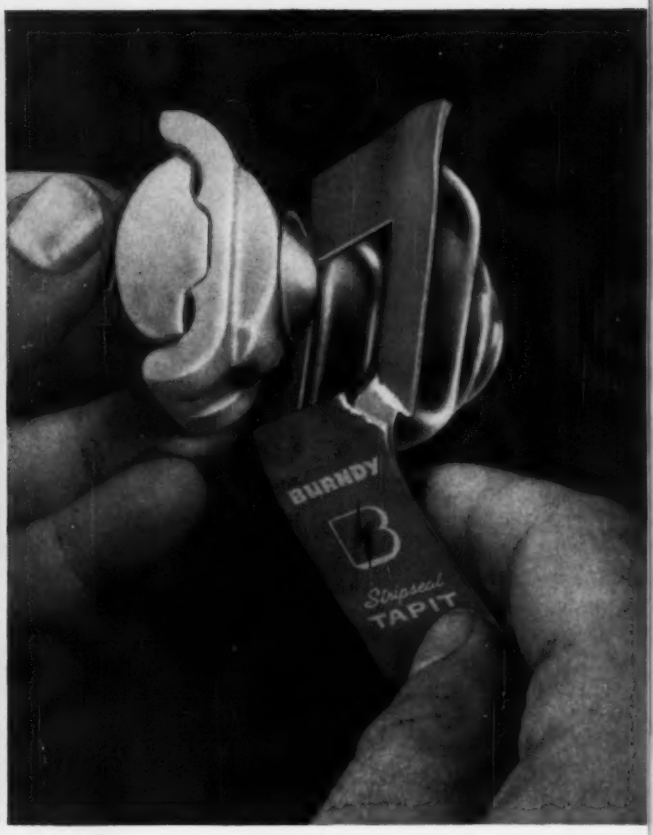
SOLD BY HARDWARE DEALERS AND INDUSTRIAL DISTRIBUTORS
Everywhere

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

STRIPSEAL

seals in oxide-inhibiting PENETROX®
...on the connector contact surfaces



No Cutting...No Snipping or Ripping...Just a Gentle Pull

TAPIT® with STRIPSEAL makes neat, clean aluminum-to-copper connections.

and your Burndy STRIPSEALED connector is ready to make a trouble-free aluminum connection. STRIPSEAL, the leak-proof, all-weather, plastic cover hugs the connector like a "cocoon"...seals in oxide-inhibiting PENETROX—on the contact surfaces, where it belongs. **It's easy to use**...even with work gloves on. **It's clean**...just dry brush conductor and install the connector; no on-the-job application of oxide inhibitor needed. **It's sure**...lineman can't forget PENETROX. For positive protection of every connection, specify Burndy connectors with STRIPSEAL. Write for full details.

BURNDY

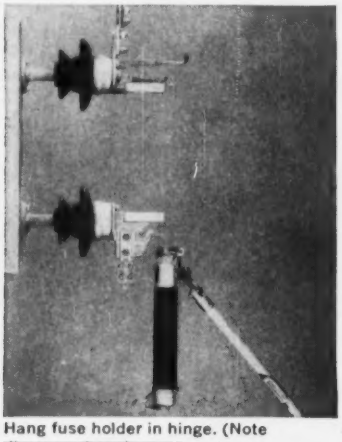
59-18

Norwalk, Connect. In Europe: Antwerp, Belgium Toronto, Canada

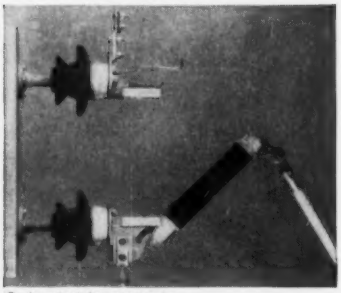
LOW-COST SWITCHING

HOW THE SM-4 SWITCHES

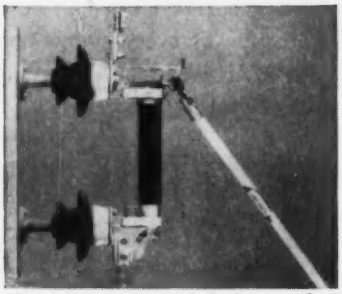
Photo at right shows the fuse being opened with Loadbuster. Photos below show closing sequence with conventional handling tool.



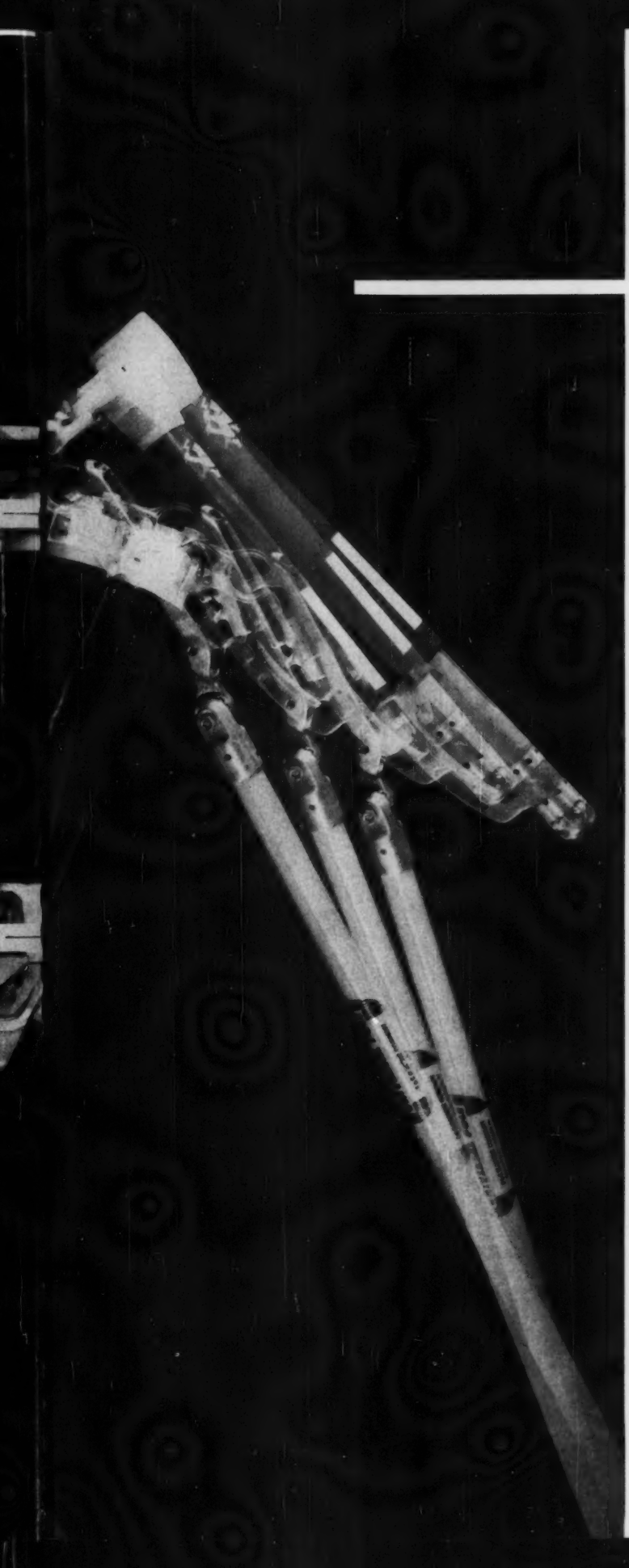
Hang fuse holder in hinge. (Note disconnect gap) . . .



Swing holder closed . . .



No need to worry about closing on a fault —the SM-4, a boric acid fuse, interrupts effortlessly.



Now even power fuses operate with S&C's Loadbuster® — no need to add a disconnect

That's right . . . no disconnect required! If it's S&C's outdoor SM-4 Power Fuse, you switch with the fuse itself—plus Loadbuster.

On transformer primaries there's no separate investment in disconnects for energizing, or for de-energizing and isolating. For line sectionalizing the same holds true—and then some! With Loadbuster it's possible to drop the line, split the load, even dump the load—up to 14.4 kv.

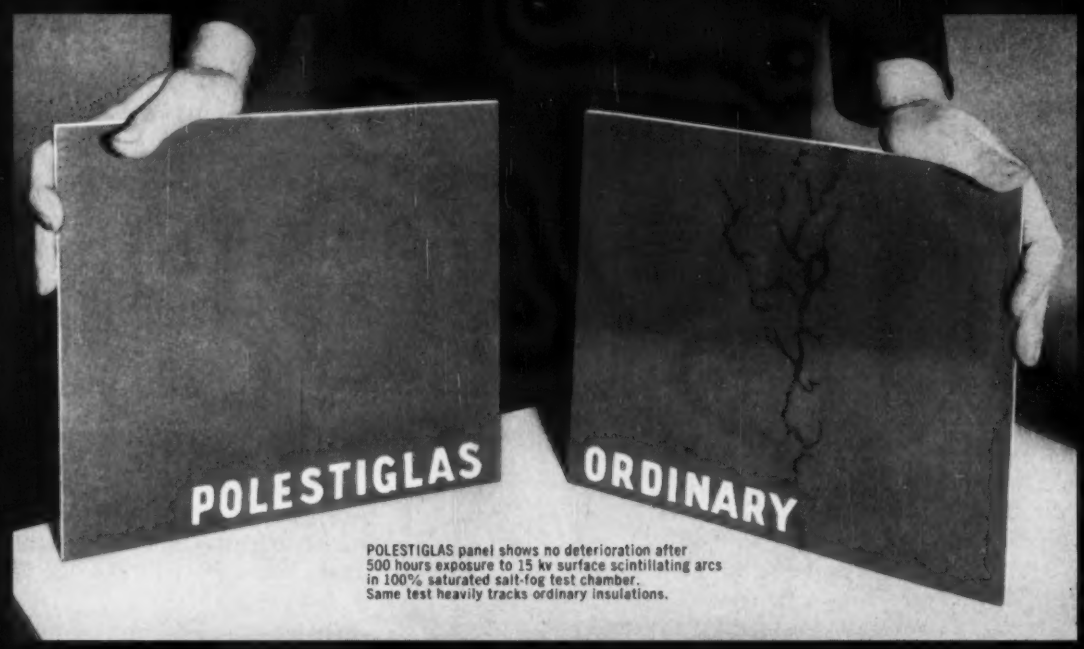
Here's how it works. The SM-4 Power Fuse is equipped with an attachment hook to accommodate Loadbuster. Just hook Loadbuster onto this hook and into the pull ring, pull fuse open and the circuit is interrupted. Result: full load switching at full voltage with no arcing, no contact burning. In one device you get full switching and isolation as well as fault protection.

The key to the Loadbuster system of universal, low cost load switching? Portability! . . . bringing the interrupting device to the power fuse, disconnect, or cutout only when it's needed. In this way the cost of Loadbuster is spread over all the fuses, disconnects, and cutouts on the distribution system.

For more information contact S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill. We will be glad to give you a demonstration of how Loadbuster works.

S&C ELECTRIC COMPANY

S&C

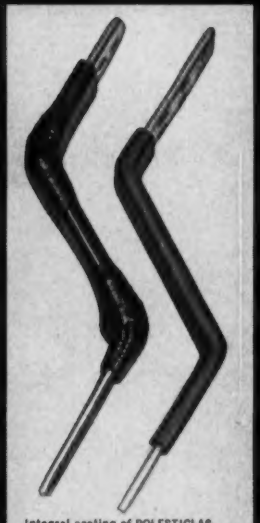


POLESTIGLAS panel shows no deterioration after 500 hours exposure to 15 kv surface scintillating arcs in 100% saturated salt-fog test chamber. Same test heavily tracks ordinary insulations.

FEDERAL PACIFIC ANNOUNCES...

POLESTIGLAS

IMPROVED INSULATION FOR METAL-CLAD SWITCHGEAR RESISTS TRACKING... GIVES NEW PROTECTION IN HIGH HUMIDITY AND CONTAMINATED AIR!



Integral casting of POLESTIGLAS (right) assures uniform bus insulation and eliminates hand-wrapped bends and offsets. Insulation is bonded to the bus bar to give void-free construction resulting in low corona loss.

Po•les•ti•glas...a cast or molded glass reinforced polyester...Provides superior insulation for metal-clad switchgear...Licks "problem" installations too tough for conventional insulation...Proves best insulation for use in areas of high humidity and contaminated atmosphere. **TEST RESULTS SHOW:** ■ Superior resistance to tracking ■ Reduced moisture absorption ■ Low, stable power factor in high humidity ■ Greater flame retardance ■ Low corona loss ■ High dielectric and impact strength. POLESTIGLAS ...another engineering achievement in Federal Pacific's program to better serve utilities and industry. Write for Bulletin 6025, Federal Pacific Electric Company, General Offices: Department 374, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

The Electrical Week

FUTURE NEWS ▶ **Watch for announcement of a new 165-Mw nuclear plant** for a major utility. Manufacturer will be asked to make certain guarantees.

LATE NEWS ▶ **Eisenhower vetoes second Public Works Appropriations Bill,** which both Houses of Congress quickly passed. As Electrical World went to press, informed sources in Washington were betting that this Presidential veto would be the first Eisenhower one to be overridden. The second bill still contains 67 unbudgeted starts and involves $1.185 billion.

Elia Kazan will now produce his movie on the TVA.

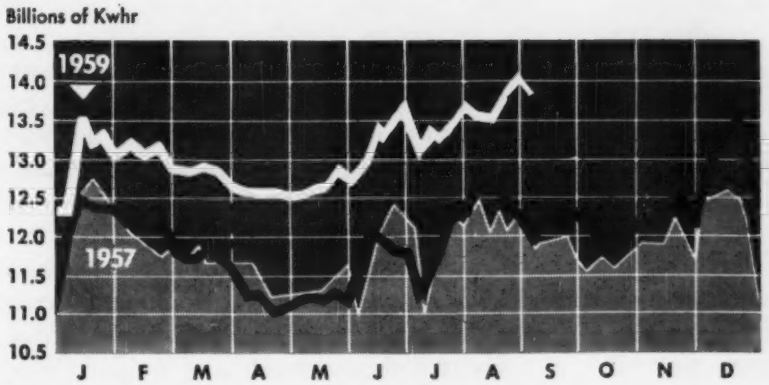
Public Service of Indiana asks PSC approval to up rates about $5.2 million a year ($2.5 million net) . . . Public Service of Colorado plans to ask for rate increases for electric and natural gas soon . . . Los Angeles Board of Water & Power Commissioners asks City Council to approve a $9.8 million a year electric rate hike.

Arkansas P&L gets FPC approval to acquire Marshall Ice & Electric for $130,000 . . . Decatur, Ind., citizens will vote on Nov. 3 whether or not to sell its municipal power facilities to Indiana & Michigan Electric for $2,099,100.

GE is planning to step-up promotion of electric heating. Decision was prompted by the fact that they think "the market is there."

Management changes . . . Toledo Ed elects J. K. Davis president and general manager, succeeding C. E. Ide, deceased. Other appointments include: Alois Hoefle to administrative vp and J. H. Barker to vp in charge of public relations. Barker is also named to the board . . . Western Massachusetts Electric names M. G. Moses vp and chief engineer . . . Allis-Chalmers names B. S. Oberlink and J. L. Singleton senior vps and R. M. Casper, vp, atomic energy div.

WEEKLY POWER OUTPUT—UP 14.4% (Week ending Sept. 5), Kwhr 13,759,000,000



Per Cent Change From Previous Year

	Aug. 22	Aug. 29	Sept. 5
Total U. S.	+12.1	+15.0	+14.4
New Eng.	+14.8	+10.6	+18.2
Mid. Atlan.	+20.6	+19.0	+25.1
Cent. Ind.	+12.1	+16.9	+10.9
West Cent.	+11.6	+23.6	+13.7
Southeast	+ 9.2	+14.0	+13.5
South Cent.	+ 9.9	+13.9	+13.8
Rocky Mount.	+ 5.6	+ 1.8	+ 6.0
Pacific			
NW	+15.9	+12.2	+ 7.1
SW	+ 7.9	+ 9.9	+13.5

Seasonally Adjusted Index 268.0

Weak Ago 262.1 Year Ago 235.4

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **Race against time is won at Montana rockslide below Hebgen Dam** as Army Engineers guide team effort to cut and face a spillway **(p 90)** . . . Water conditions are gloomy compared to last year's good hydro conditions **(p 91)** . . . Duke Power Co buys Nantahala system for $4 million **(p 93)** . . . Unusual fault of 330-Mva transformer puzzles supplier **(p 92)** . . . Formation of a Federal Radiation Council and the prospect of new legislation indicate a shift is under way on control over radiation safeguards **(p 93)**.

SPECIAL REPORT FORECAST ▶ **Highlights of EW's 1959-75 Forecast on page 97:**

- Total construction expenditures are expected to fall off 4.1% to $4.7 billion, just about the same rate as in 1957.
- Generation will trim 1960 budget 4.1%; transmission will go down about 7% but will begin climbing in 1961.
- Distribution spending will be up 9.6% in 1960.
- Peak load in December is slated to go up 10.6% this year.

ENGINEERING ▶ **Atlantic City Electric uses small units** to give it low-cost peaking **(p 113)** . . . SF_6 breakers pass service test at Gulf Power **(p 120)** . . . Consumers Power helps to solve voltage flicker problems caused by resistance welders **(p 123)**.

Politics and Public Power

ANOTHER RUSSIAN TOUR

A 10-man delegation of power officials, leaning heavily toward public power, are expected to leave about Sept. 15 for a one-month tour of the Soviet Union's hydro-electric facilities. Visas and other red tape apparently have been cleared away.

The makeup of the delegation isn't quite the same as the one that's been hanging fire for some time—the official government-to-government exchange that would include Administration officials, members of Congress, and non-government officials. That trip is still hanging fire.

The Senators interested in the hung-up trip have gone directly to Soviet Ambassador Menshikov, and arranged a trip on their own.

Clyde Ellis of National Rural Electric Cooperative Assn, and Alex Radin, general manager of American Public Power Assn will be included. Although Ellis and Radin will pay their own way, it is expected they will be named as consultants to the Senate Interior Committee for the duration of the tour. This possibility was mentioned previously in these columns (EW, June 22, 1959, p 36).

Two Senators—Frank Moss (D-Utah) and Ernest Gruening (D-Alaska)—will head up the delegation of eight. Moss will carry a temporary title of Chairman of the Senate Interior Committee for purposes of the trip. Moss and Gruening are members of the Senate Interior and Public Works Committees.

Other government members include: Michael Strauss and Milton Mapes of the Senate Interior Committee, Theo Sneed of the Senate Public Works Committee, and Vic Reinemer, secretary to Sen James Murray.

Harry Kuljian, president of Kuljian Corp,

PROCUREMENT & PRODUCTS ▶ **Utility purchasing departments are expected to be busier** next year as distribution construction is slated for a 9.6% rise . . . Copper and foreign steel prices rise **(p 126).**

MANUFACTURERS ▶ **Line Material develops brighter fluorescent luminaire** using a Peltier thermo-electric heat pump . . . Allis-Chalmers reduces by 20 to 30% the size and weight of its standard small power transformers . . . S&C builds electrically-heated Chicago laboratory . . . Penn Union purchases Western Insulated Wire **(p 128).**

NEW EQUIPMENT ▶ **Demand meters have improved printing systems** and universal-mounting cases . . . Bus grounding clamp provides temporary grounding for substation buses . . . 4.16-kw switchgear has modular assembly **(p 134).**

MANAGEMENT ▶ **Utility executive compensation still lags the average** of all industries, but the gap narrowed in 1958. Survey shows that utility chief executives earned about 6% more last year than in '57, while all industries' top men averaged a 1.8% cut **(p 165).**

SELLING ▶ **Southern California Edison appliance survey** got an 80% return by using a simple questionnaire designed to get results **(p 152).**

a Philadelphia engineering firm and Harvey McPhail, Kuljian hydro-electric department manager, also will make the trip on a non-governmental basis. McPhail is a former assistant commissioner of the Bureau of Reclamation under Truman Administration.

The group will spend about three weeks in the USSR. They hope to visit the sites of several huge hydro power projects in Siberia —both proposed and under construction. These include Bratsk, Irkutsk, Krasnotarsk, and Yenisey Dams. They also hope to visit the cities of Stalingrad, Sverdlovsk, Novosibirsk, Tiflis and Sochi (a resort).

The group will study three particular fields in which Russia reportedly has made rapid progress: HV transmission, cold weather operations, and huge hydro turbines.

Pro-federal power supporters have critized the Eisenhower Administration in promoting the tour of Soviet installations, specifically hitting the Administration's refusal to consider inclusion of Ellis and Radin. Federal power advocates also claim that U.S. permission for two private-power delegations to tour Russian facilities has delayed the chance for this third tour.

What will come of the tour? At this time, it's hard to say. It's unlikely that any elaborate technical and engineering reports, aimed at giving U.S. power men some insight into Russian advances, will be the result.

Rather, look for an urgent call to arms "development of our power resources on a nation-wide, federally coordinated basis for the benefit of all our people"—as the only means of beating the Russians in a power race in which the stakes are "nothing less than survival."

It may not be so, but that's politics.

Nuclear Notes

By January 1 AEC hopes to have a comprehensive 10-year plan for the civilian power reactor program. Goal will be to evaluate the relative importance of each reactor concept and what AEC support it will get, U. M. Staebler of AEC's Reactor Development Div recently told the American Nuclear Society.

Power cooperatives are "lukewarm at best" about accepting AEC's latest invitation to help build and finance an experimental atomic power reactor, says the Cooperative League of the USA. Managers are said to feel the pressurized water reactor is "a long shot" that wouldn't generate power at costs approaching conventional fuels unless some completely unforeseen factor develops.

Fuel element failure at AEC's Sodium Reactor Experiment at Santa Susana, Cal., resulted in no release of radioactive materials to the plant or its environs. Operating personnel were not exposed to harmful conditions. Important technically, the occurrence is getting detailed study to determine the cause. Early indications are that the damage may have been caused by restrictions in coolant passages resulting from introduction of organic material into the reactor.

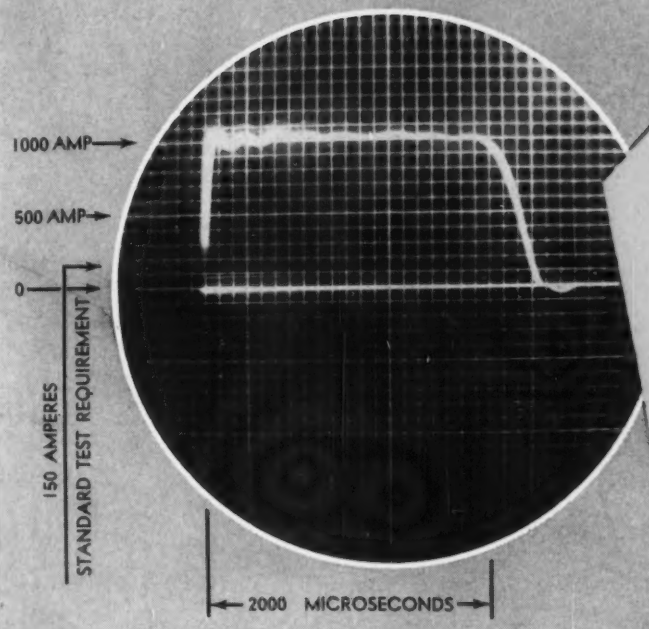
A two-week course in nuclear safety will be offered by AEC beginning Sept. 21 at Oak Ridge, Tennessee. It will emphasize the prevention of criticality in handling fissionable materials.

Extensive tests are underway at Parr, S. C., to measure "as-found" site radiation preparatory to construction of the Southeast's first nuclear power plant by Carolinas Virginia Nuclear Power Associates. Construction of the plant will begin early next year and be finished in mid-1962.

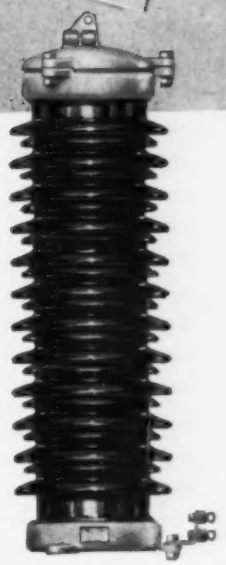
Britain's Nuclear Power Plant Co in concert with AEI-John Thompson Nuclear Energy Co plan a joint bid for the 500-Mw Dungeness station, based on a common design. They will follow a similar procedure later in bidding for the Sizewell 600-Mw station. The two firms have agreed to collaborate in future work; a move that reflects the fact that prospects in Britain for nuclear power plant work—especially foreign orders—are much less bright than they were a few years ago.

A two-day symposium for management and technical personnel on the reprocessing of nuclear fuels is to be held October 20-21 at Richland, Wash. under joint sponsorship of the AEC and its contractors. Reviewed will be technology for reprocessing spent fuels from power, test, and research reactors, mechanical handling methods, chemical processes, materials of construction and site plans.

"Beyond the call of duty"



Thorex arresters exceed by many times standard durability requirements



Durability is one of the biggest features of Thorex Dynagap lightning arresters -- a capacity to withstand the heavy, and sometimes unpredictable demands imposed by modern transmission systems.

This characteristic can be measured. ASA Station Class Durability Standards require an arrester to withstand a series of 20 discharges of 150 amperes, having a duration of 2,000 microseconds. These discharges are spaced over a time period of 75 minutes which permits valve block cooling between applications.

Compare the standard with the oscillogram shown here. Station Class Thorex arresters are tested, not at 150 amperes, *but at 1,000 amperes or more!* The O-B impulse generator is set on fast automatic cycling and applies a discharge every 20 seconds, allowing no thermal relief period.

Nearly seven times the required standard current is applied in less than one-tenth the allowable period of time. Because of the cumulative effects of this severe test procedure, it would be difficult to evaluate Thorex performance against standard requirements.

This is the kind of durability you get in Thorex arresters. Durability "far beyond the call of duty." And this is another reason why your stations should be Thorex-equipped.

OHIO BRASS CO., MANSFIELD, OHIO

Ohio Brass OB HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

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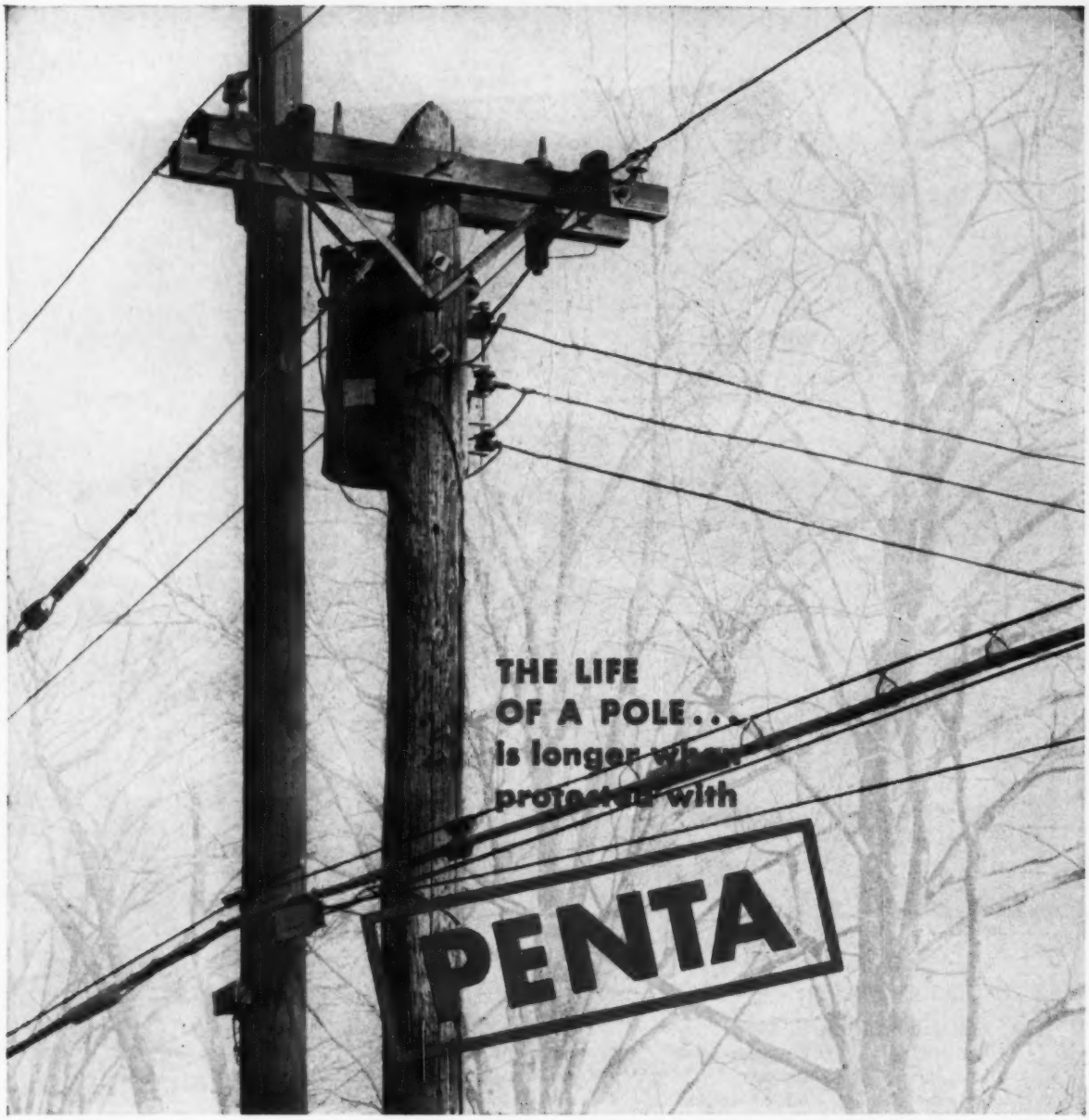


Today, more and more men with maintenance on their minds will tell you . . . it's good business to protect lumber with PENTA treatment. Here's why:

1. Costs no more — Service records show PENTA treatment gives poles, cross ties and other lumber for exposed structure extra long life. Yet PENTA treatment costs no more than ordinary preservatives.

2. Won't leach out — Because PENTA is an oil-borne rather than water-soluble preservative, it doesn't leach out, leaving wood vulnerable to rot and termites.

3. Clean to handle — Construction and maintenance supervisors know that workmen handle clean wood faster, more efficiently — and with fewer kicks!

Reichhold is a major supplier of PENTA to the wood industry and to wood users. If you haven't done so yet, investigate this modern method of protecting your lumber investments — write for the name of your nearest Reichhold distributor of PENTA.

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenate
Sulfuric Acid • Methanol

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N.Y.

Creative Chemistry . . . . . Your Partner in Progress

CLEAR HORIZONS

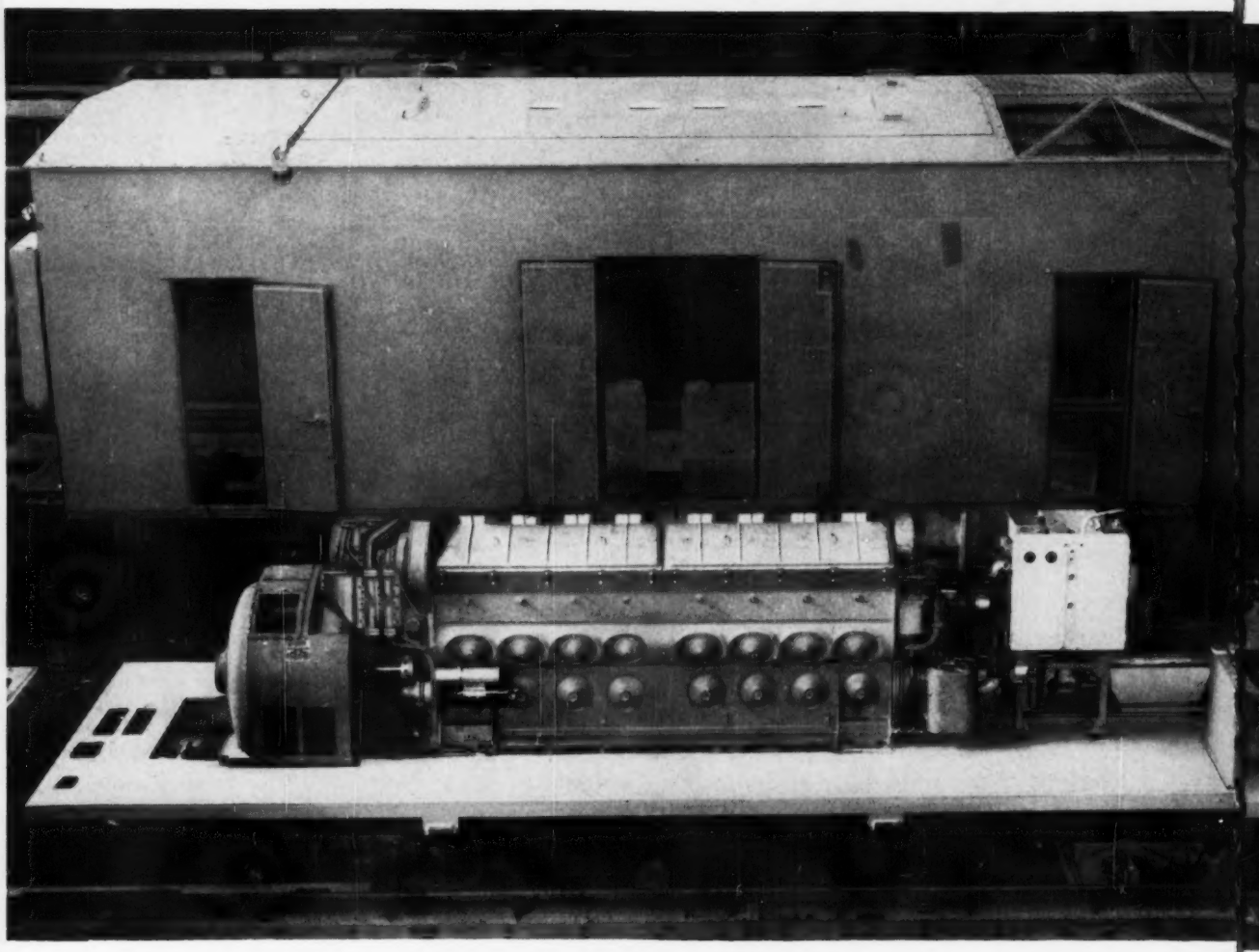
for modern construction are now possible with RT&E's Terra-Tran for underground distribution. Terra-Tran provides improved appearance for residential areas, more reliability for industrial plants, greater safety for institutions, and freedom from primary wires and poles for shopping centers. Terra-Tran is truly the long-sought key to economical underground distribution.

RT&E CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

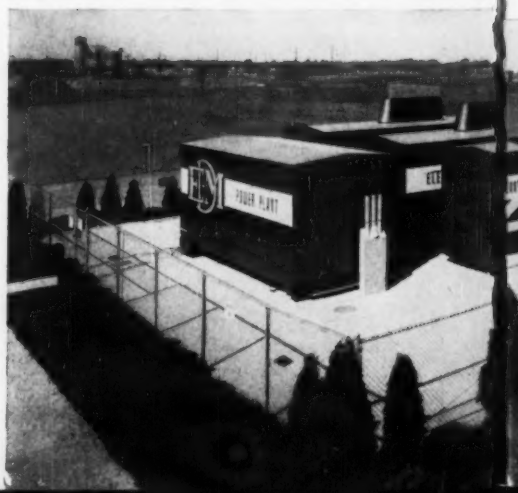
HH

Push-button peaking plant . . .

FROM COLD START TO

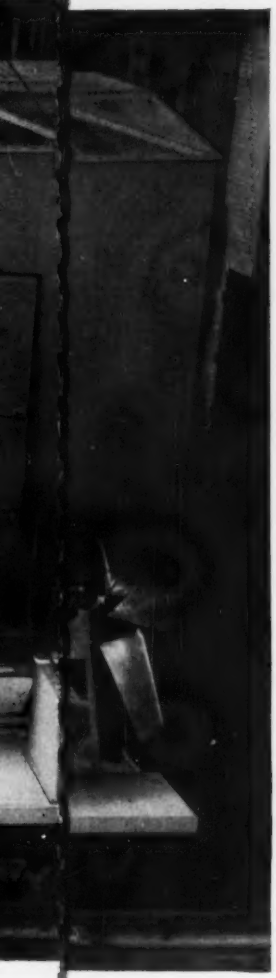


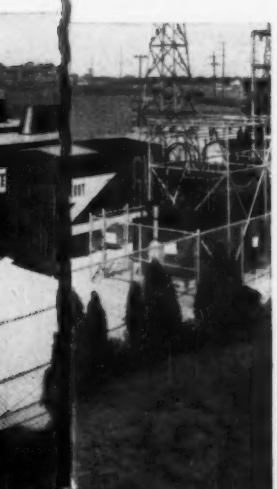
Weather-proofed, sound-deadened housing is lowered over prime mover, generator and supporting auxiliaries. More than 20,000 prime movers and generators have been produced by Electro-Motive over a twenty-one year period.



Entire plant as it appears installed at the step-down substation serving the load. Self-contained, outdoor-type units require no expensive building or complicated foundation work. From time of order to complete installation requires less than five months.

TO FULL LOAD IN 90 SECONDS





Electro-Motive MU-60 provides automatic, unattended supply for peak loads, system reserve, area protection

Within 90 seconds from starting signal, the unattended 6000 KW Electro-Motive plant is on the line at full load—providing an immediate and economic answer to problems of peak demand and spinning reserve. A look inside reveals why this quick response is possible:

First, the MU-60 is composed of components that have been applied to a wide range of applications over a 21-year development period. In thousands of hours, under all kinds of operating conditions, their records of performance have set new standards of reliability, durability, and low maintenance. The result is a standardized plant featuring low first cost,* and low operating and maintenance costs.

Second, the MU-60 prime mover—the famous General Motors 567 series two-cycle Diesel engine—is inherently suited to fast starts and changing loads with long service life.

Finally, the plant's basic control equipment provides for unattended automatic operation at a remote location which makes it an ideal choice for area protection.

Because of standard components and design simplicity, the MU-60 has a high degree of flexibility and operational advantages. For example:

- **Unitized, self-contained design permits economical installation of less than $15 per K.W.**
- **Application at points of load reduces line loss from central locations.**
- **Building-block principle of application permits fitting power needs to area demand and growth.**
- **Plant may be increased in capacity at low incremental cost.**

Ask your Electro-Motive representative for additional information about the economy and operational advantages of the Electro-Motive peaking plant.

**$85 per kw, f.o.b., LaGrange, Ill.*

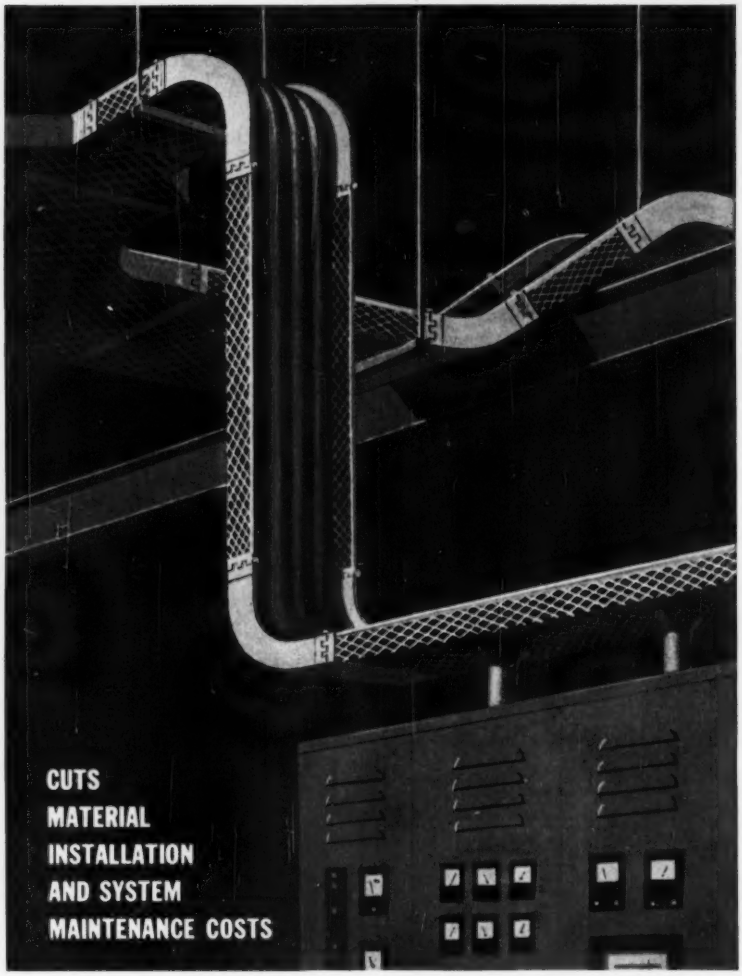
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS • LA GRANGE, ILLINOIS

Sales-engineering offices: Chicago, New York, St. Louis, San Francisco

In Canada: General Motors Diesel Limited, London, Ontario

COPE WIREWAY

FOR POWER CABLE DISTRIBUTION



A single run of Cope Wireway supports as many cables as several runs of conduit. Exclusive pin-type coupler assures quick, easy installation of lightweight aluminum or galvanized system components—even in cramped quarters. Cables are easy to get at for inspection, re-routing or system expansion needs.

ORIGINATORS OF THE FIRST INTEGRATED LINE OF CABLE SUPPORTING SYSTEMS

COPE

FACTS AND FIGURES FOR UTILITIES

250 TONS OF STEEL SAVED
—at Jersey Power Station

PROBLEM

Select system equipment to support over 100 miles of cable at New Jersey power generating station.

SOLUTION

Careful cost analysis of available methods and materials convinced engineers on the job that Cope's expanded metal wireway was the best choice. Why? Among other reasons, it meant a saving of more than a ton of steel for every 60 feet of wireway installed, as compared to conduit . . . a total saving in excess of 250 tons of steel for the 15,000 feet of wireway required for the complete job! Expanded metal wireway simply uses *less* steel to do the job—and this adds up to real economy regardless of the size of your installation.

ASK FOR PROOF! **Get additional cost saving details from Cope for your next cable installation. Contact an Authorized Cope Electrical Wholesaler—or write for detailed Engineering Data.**

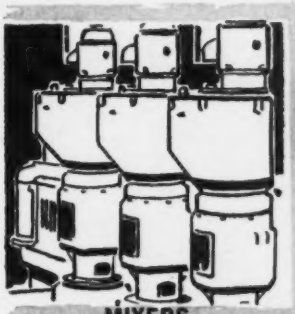
COPE SUPPORTING SYSTEMS SOLD *ONLY* THROUGH *AUTHORIZED* ELECTRICAL WHOLESALERS

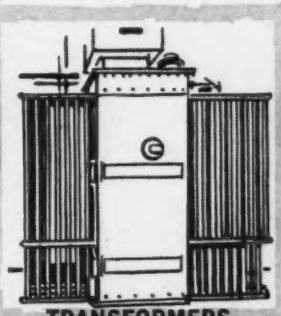
1015

Makers of . . . Cope Cable Ladder, Cable Channel and Controlway . . . the Lowest Cost Support for Low Voltage Control and Signal Circuits. Also a Complete Line of System Supports and Accessories.

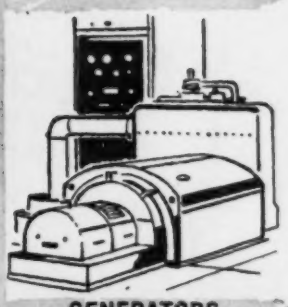
Division of **ROME CABLE CORPORATION**
COLLEGEVILLE, PENNSYLVANIA

Which of these common fire hazards threaten you?

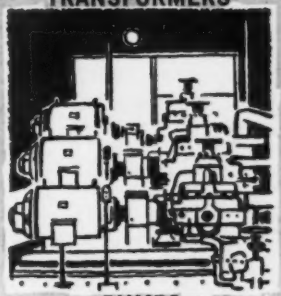

MIXERS

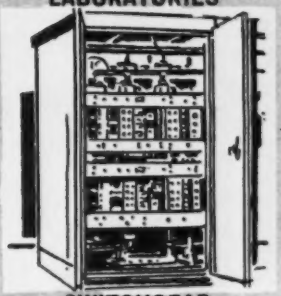

TRANSFORMERS

LABORATORIES


GENERATORS

DRYERS


PUMPS


SWITCHGEAR

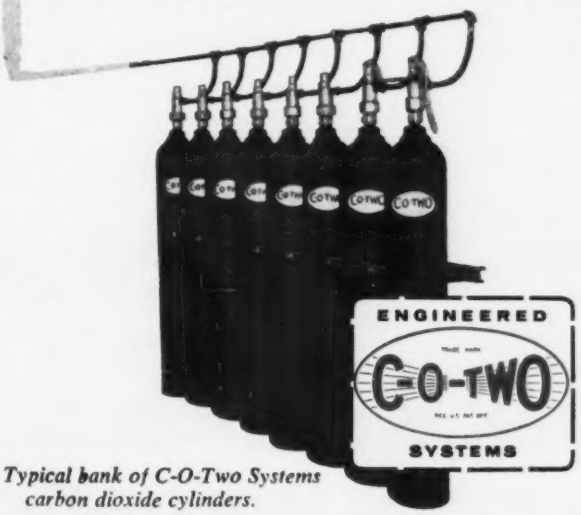
VENTILATING DUCTS

If your plant has one or more of these common fire hazards, ordinary fire protection may not prove adequate! You also need special fixed-type protection that constantly guards specific highly hazardous areas!

C-O-Two Fire Extinguishing Systems are specially designed for closed or partially-closed spaces in which highly flammable liquids or solids are manufactured, handled or stored . . . or where there is fixed or rotating electrical equipment. The C-O-Two line includes dependable, high-quality carbon dioxide, dry chemical or foam systems to extinguish fire, plus detecting systems to detect and locate fire automatically.

Your experienced C-O-Two representative is well qualified to carefully analyze all special hazards. Because he offers the industry's largest line of fire protection products and services, he can make equipment recommendations without prejudice. Each C-O-Two System is carefully engineered and manufactured . . . and C-O-Two will also expertly install the system, if desired.

Why not review your common fire hazards now? If protection is either lacking or inadequate, you can confer at no obligation with your nearby C-O-Two Industrial Fire Protection Engineer! Call him today at these offices:



Typical bank of C-O-Two Systems carbon dioxide cylinders.

products of
THE FYR-FYTER COMPANY

ATLANTIC COAST REGIONAL OFFICE
P.O. Box 750, Newark 1, New Jersey
CENTRAL STATES REGIONAL OFFICE
221 Crane St., Dayton 2, Ohio
PACIFIC COAST REGIONAL OFFICE
132-140 Hawthorne St., San Francisco 7, California

BRANCHES: Atlanta, Baltimore, Boston, Chicago, Dallas, Dayton, Detroit, Los Angeles, New York, Newark, Philadelphia, Pittsburgh, Portland, Rochester, San Francisco, Seattle, Toronto (Ontario). Representatives and Distributors in all principal cities.

A look inside an E-M Straight-Up-Ventilated

A Smooth Running Motor

HAND-CRAFTED CONSTRUCTION
by skilled craftsmen is the only way to achieve the smooth motor operation shown in pictures at right, top. Coils are carefully lashed one to the other and to heavy support rings. Bearing brackets are hand tooled for perfect bearing fit.

E-M

ELECTRIC MACHINERY

Builders of the new pump motor

1300-TPA-2203

Boiler Feed Pump Motor will show you

Doesn't Just Happen...

LISTEN CLOSELY. This running E-M Motor is not dead silent—just remarkably quiet. And when you stand near an E-M Straight-Up-Ventilated Motor, you aren't blasted in the face with hot air. Cooling air goes straight up.

NICKEL-ON-EDGE demonstrates fine balance of operating E-M boiler feed pump motor. Engineers visiting E-M factory learn Straight-Up-Ventilated Motor balance is far superior to usual commercial standards.

Quiet operation, precise balance result from E-M's imaginative engineering, thorough workmanship

The eye-opening boiler feed pump motor performance pictured above isn't confined to the test floor. It lasts for years. And E-M planned it this way because power plant engineers asked for it.

Yes, here is a motor that embodies those design features most wanted by power plant engineers:

1. Locked-in rotational stability that assures a lifetime of smooth operation.

2. Built-in acoustical control that makes the motor as quiet as the pump.

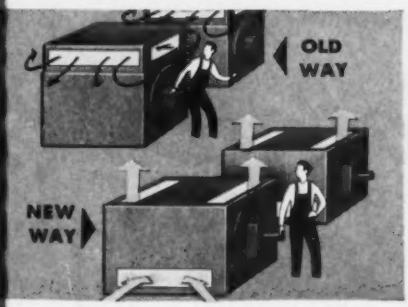
3. Top air discharge that carries ventilating air up and away—no recirculation or cross circulation to affect cooling of motors.

4. Easy access that enables one man to disassemble the motor for routine inspection without a hoist.

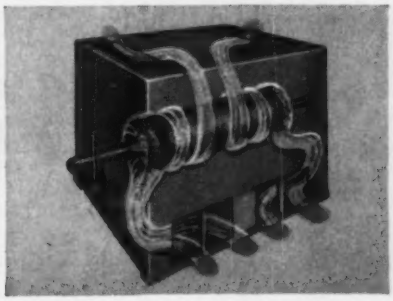
5. A low silhouette that lets you look over the motor to see other personnel and equipment in the pump room.

Your nearby E-M Field Engineer will be glad to give you complete details of E-M's finer motor construction. Call him, and write the factory for your free copy of the Straight-Up-Ventilated Motor Brochure No. 1134P.

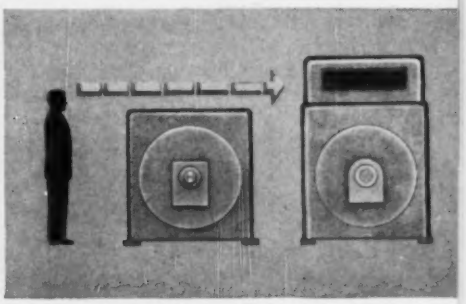
MANY BIG DIFFERENCES MAKE THE DIFFERENCE



STRAIGHT-UP-VENTILATION



AIR-FLOW ACOUSTICAL CONTROL

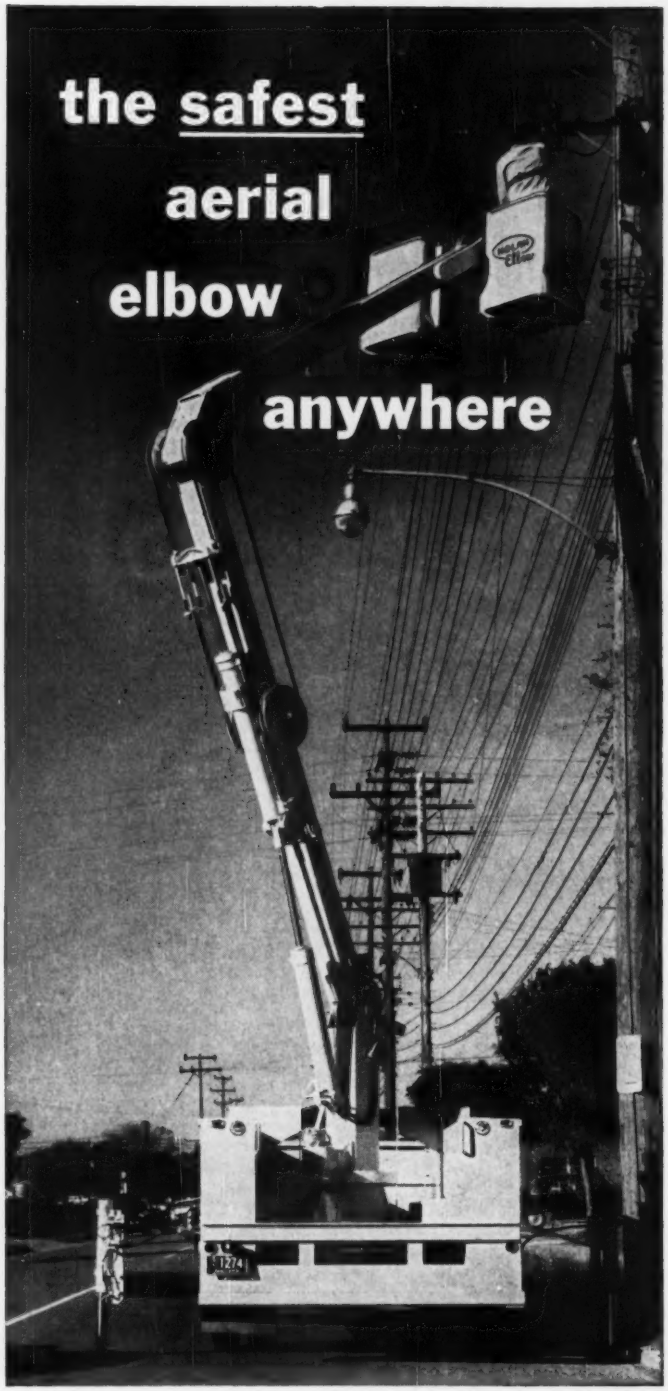


MINIMUM HEIGHT—MAXIMUM VISIBILITY

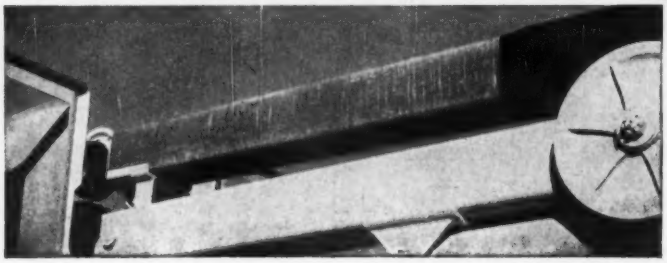
MFG. COMPANY MINNEAPOLIS 13, MINNESOTA

that performs as well on the job as on the test stand

1134P.



Holan fiber glass section in upper arm



Holan Elbow has precise aircraft-type cable controls and strong, non-conductive fiber glass section in upper arm

With a Holan Elbow, it's easy to get to the problem—and safe when you get there.

The exclusive cable control system provides easy, precise spotting of the buckets. And a fiber glass section in the upper arm insulates workmen in the buckets from the ground.

The fiber glass section is solid—*not* metal enclosed with fiber glass. Also, control cables and leveling cables have fiber glass inserts so that men in the bucket are completely separated from metal-to-ground contact. In a bucket-to-ground test, the non-conductive fiber glass section withstood 100,000 volts for one minute.

As for strength, in a separate test the fiber glass section required a 6,200-pound load at end before failing. This is a safety factor in excess of 7 as nominal capacity and weight of the buckets total 800 pounds.

Safety does come first but there are many operating features to talk about, too. Write for all the details.

Holan Corporation, 4100 W. 150th St., Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Ariz.

Holan

Subsidiary of THE OHIO BRASS COMPANY

Alabama Power Company

Boston EDISON Company

CENTRAL HUDSON

NIAGARA MOHAWK

PHILADELPHIA ELECTRIC COMPANY

KELLOGG'S FABRICATION-ERECTION SERVICES KEEP PACE

No designer-fabricator-erector of power piping has worked so closely with the industry as Kellogg to meet the increasingly more critical steam pressure/temperature requirements of the nation's electric utilities.

Long a leader in the application of the newer alloys, and in the development of better welding materials and welding techniques for the power generating industry, Kellogg is today privileged to announce more than a dozen projects concurrently executed with the *five* major utilities, listed above. Each of these major assignments includes the use of Kellogg's K-Weld® technique for welding the main steam and other critical lines, both in field erection and shop fabrication.

Kellogg welcomes inquiries on its complete fabrication and erection service to the power piping industry from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

Fabricated Products Sales Division, THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

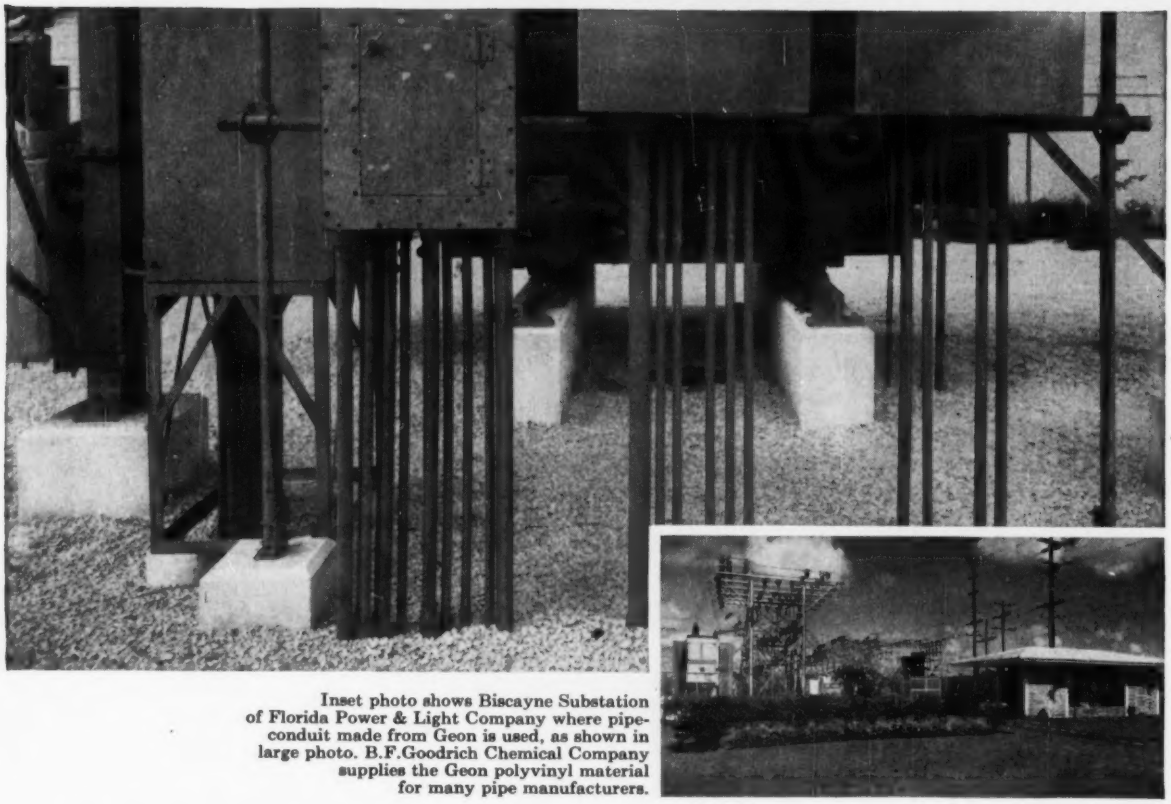
The Canadian Kellogg Co., Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., Buenos Aires • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

®Registered trademark of the M. W. Kellogg Company. Process Patented

News about

B.F.Goodrich Chemical *raw materials*



Inset photo shows Biscayne Substation of Florida Power & Light Company where pipe-conduit made from Geon is used, as shown in large photo. B.F.Goodrich Chemical Company supplies the Geon polyvinyl material for many pipe manufacturers.

At 125 substations . . .

FP&L plans for future . . . uses conduit of Geon

Florida's rapidly expanding economy has called for fast, sure growth on the part of Florida Power & Light Company. At 125 distribution substations located throughout the state, FP&L has installed conduit made of Geon rigid vinyl—as much as 3,000 feet at some locations.

Conduit of Geon rigid vinyl is lightweight and economical to install—and promises satisfactory service far longer than ordinary conduit because it is unaffected by most causes of corrosion. Internal and external surfaces stay smooth—like new through the years.

Geon resists the corrosive effects of salt water, gases, chemicals, and acid or alkaline soils. It also resists sunlight, fungi, bacteria, moisture, heat and cold. It offers high tensile or impact strength and is not affected by galvanic corrosion.

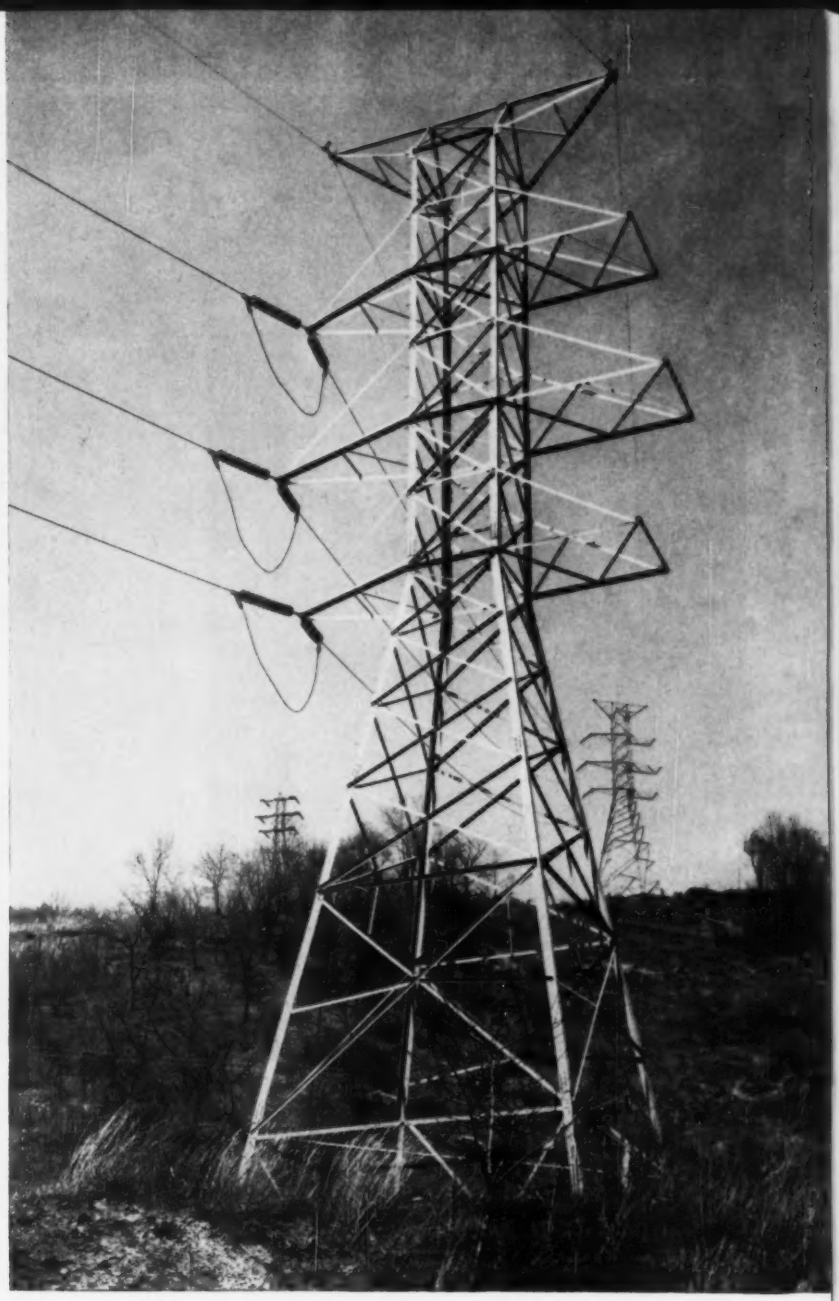
Engineers are finding new and cost-saving uses for pipe and conduit made of Geon in many applications, both above ground and underground. For information, write Dept. AT-7, B. F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

91-foot Blaw-Knox Transmission Tower is one of ten on Monongahela Power's Rivesville-Willow Island line. Steel grillage earth anchors are used because of the mountainous terrain.



Monongahela Power Company uses Blaw-Knox Towers in expanding 132,000-volt line

Ten Blaw-Knox steel transmission towers are in service on the Rivesville-Willow Island line of the Monongahela Power Company, Fairmont, West Virginia. Each of the towers is designed to handle double circuit conductors, but at present carries only single circuit 556,500 cm 26/7 ACSR conductors.

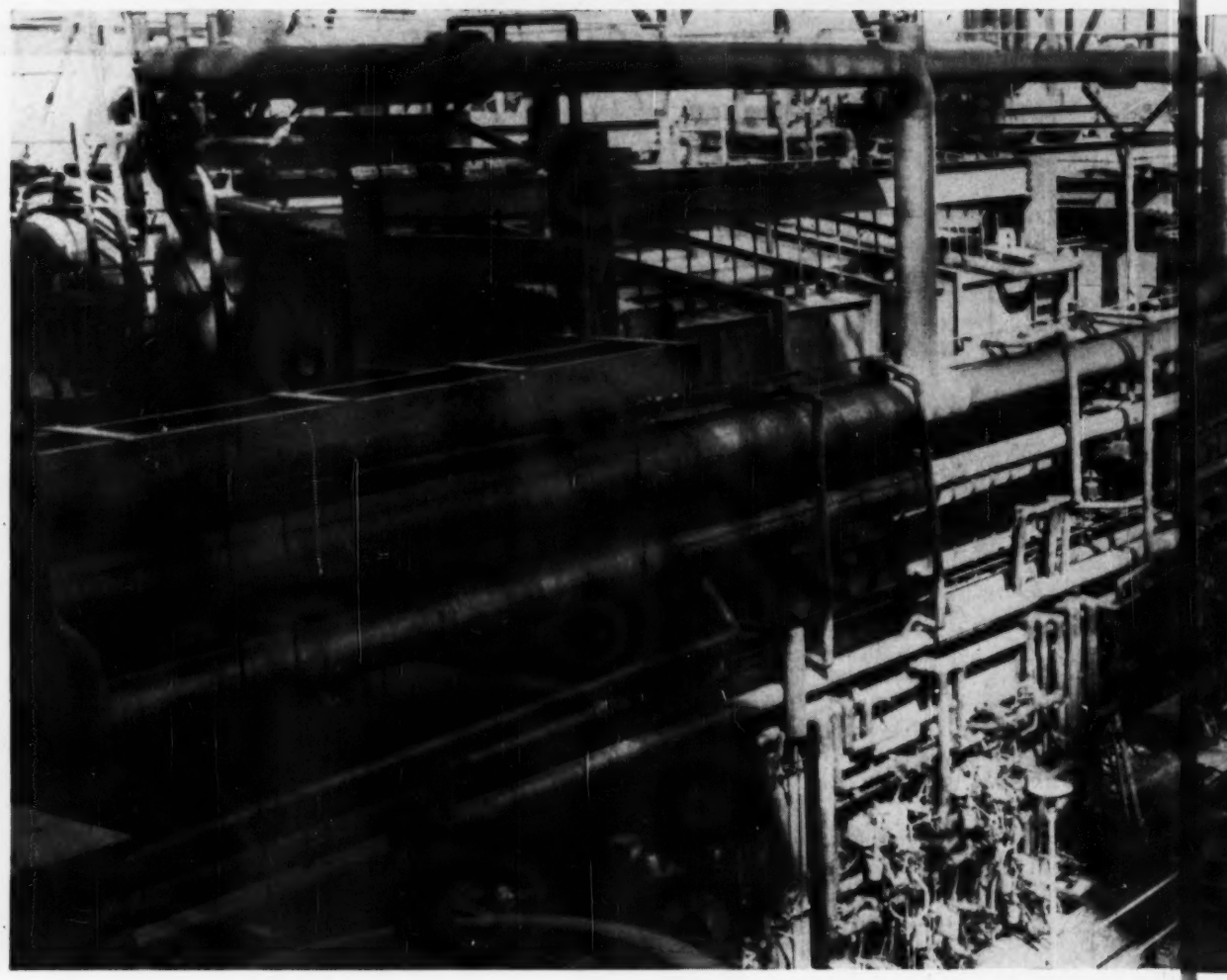
Blaw-Knox towers were first used by Monongahela Power on its lines in 1929, and is typical of the long association of Blaw-Knox tower specialists with electric power companies. For Blaw-Knox brings more than forty years' experience to bear on each transmission tower project. The result: towers that are superior in strength, simpler to erect, easier to modify.

Today's problems, such as those you face in balancing circuit capacity with generating capabilities, can be eased with the help of Blaw-Knox tower specialists in modifying present transmission lines. A new bulletin complete with engineering descriptions of Blaw-Knox towers and anchoring systems is yours for the asking. There is no obligation, of course.

Transmission Towers—Steel transmission towers custom built for each installation . . . multi-circuit and other special structures . . . guyed and self-supporting antenna towers for AM, FM, TV and Microwave Antennas . . . rotating . . . Radar Radio Telescopes . . . Tropospheric scatter and Ionospheric scatter.

BLAW-KNOX

BLAW-KNOX COMPANY
Blaw-Knox Equipment Division
Pittsburgh 38, Pennsylvania



Copes-Vulcan boiler control load conditions at Deepwater

In addition to producing power for the Atlantic City Electric Company system, the Deepwater plant delivers steam to an adjacent chemical plant for process use.

To meet the widely fluctuating process demands, Copes-Vulcan controls the two low pressure boilers with precision responsiveness. Each boiler has a maximum continuous rating of 150,000 pounds per hour at 230 psig saturated. The system consists of:

Combustion Control maintaining a constant pressure in the main process steam header by holding steam output from the boiler equal to steam demand.

Copes-Type 3-L Feedwater Control modulated by three control influences—steam flow, feedwater flow and drum water level.

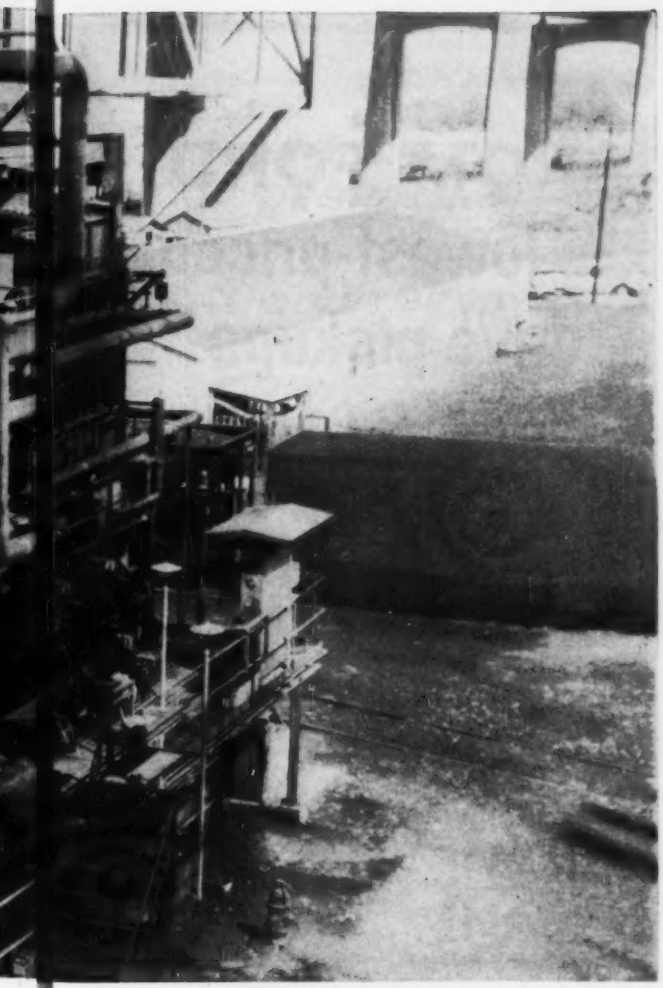
Boiler feed pump recirculation control protecting the boiler feed pumps against overheating on light loads.

Vulcan Rotary Soot Blowers providing positive cleaning over the full blower arc, which may be as much as 360 degrees.

The system controls all equipment with either one or two boilers in service, permits each boiler to carry a different load. Control is automatic through a load range of 20,000 to 200,000 pounds per hour.

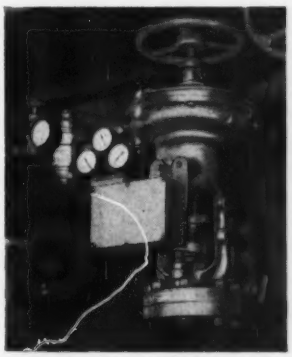
Whether your boiler is large or small, power or process, Copes-Vulcan can provide a unit or an integrated package, custom designed to your requirements. **For details on the Deepwater Station installation, write for Bulletin 1057.**

Copes-Vulcan Division
BLAW-KNOX COMPANY • Erie 4, Pennsylvania



Outside boilers and boiler controls subject to severe weather, with temperatures as low as 10° F. Except for the central control panel and relays and controllers mounted on it, the Copes-Vulcan control system is entirely outdoors.

meets unusual Station

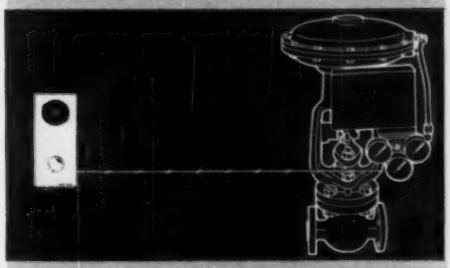


Diaphragm-operated CV-D valve controls the speed of the turbine driving the forced-draft fan. Copes-Vulcan also makes piston-actuated valves. Both types meet pressure standards of 125 to 2500 pounds.

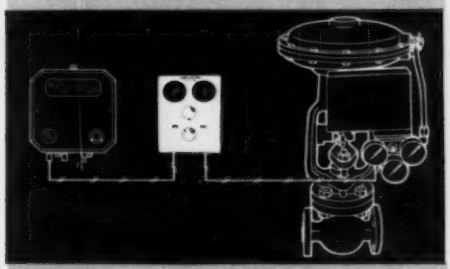
The drive unit with positioner, 4-way valve, power piston and feedback cam controls forced-draft damper. C-V drive units permit remote positioning by automatic or manual pneumatic signals.

C-V NEWS NOTES

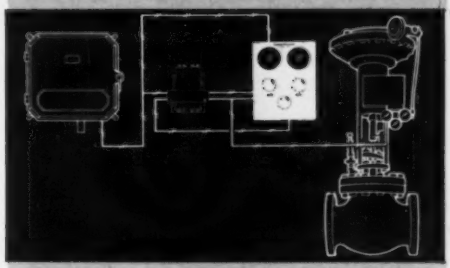
PNEUMATIC CONTROL STATIONS



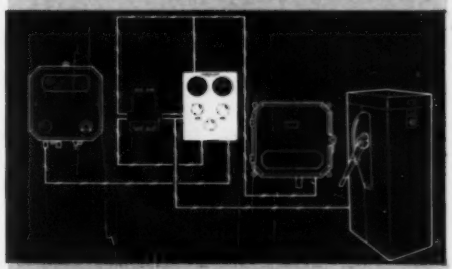
Copes-Vulcan stations offer automatic-to-manual selection without the complication of seal balance. They indicate process-variable, controller and manual loadings. Transfer is "bumpless" without process disturbance. Shown above: the ML-4 Manual Loading Station.



AM-4 Selector Station . . . indicates an automatic loading—or originates a manual loading—to the valve, power cylinder or other control element.



AMS-4 Remote Set Station permits manually adjustable set-point loading, or independent manual operation, of the control element.



AMBC-4 Cascade Biasing Station, used with pneumatic stacked diaphragm controllers, permits plus-or-minus biasing of a cascaded set-point to the controller.

For details about Copes-Vulcan's complete line of pneumatic control stations, write for Bulletin 1031.

New Ford F-100 4-wheel drive Styleside pickup handles heavy loads and makes its own road.

ALL FORD-BUILT . . . FACTORY-ENGINEERED . . . FOR GREATER SAVINGS!

Go *Ford*-ward for 4-wheel drive performance at big Ford savings. New Ford 4 x 4 Pickups have the power and traction to go most anywhere. They're factory-engineered from the ground up for extra stamina, and all Ford-built with your choice of economical Short Stroke power—Six or V-8.

There's new versatility too, with two power take-off points in the transfer case to drive winches, saws, diggers, or other equipment. And there's new driving ease. You shift smoothly between 2- and 4-wheel direct drives while moving. Ford's *driverized* cab provides new riding comfort and modern styling.

Ford 4-wheel drive trucks are available in ½- and ¾-ton pickups, chassis-cabs and ¾-ton stake models. See your Ford Dealer . . . and save hundreds of dollars on America's lowest-priced 4 x 4's with Six or V-8 engine!

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

NEW SIMPLICITY OF DESIGN...

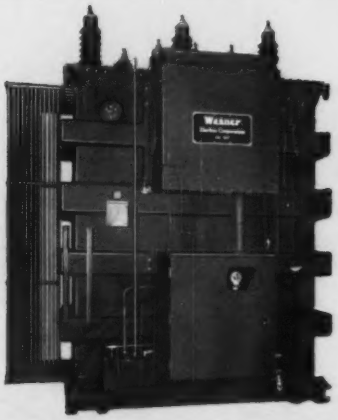
NEW QUIETNESS OF OPERATION

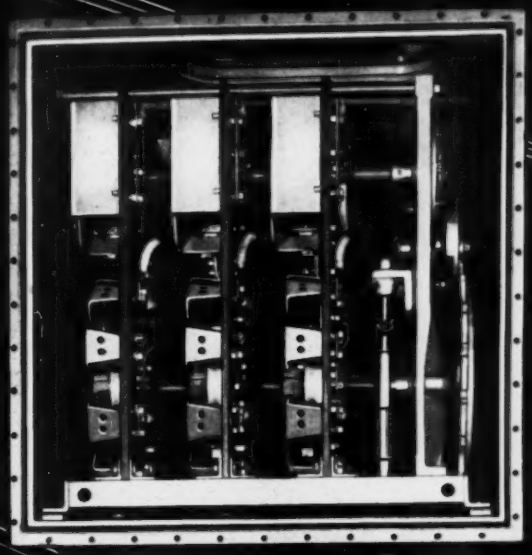
NEW FREEDOM FROM MAINTENANCE

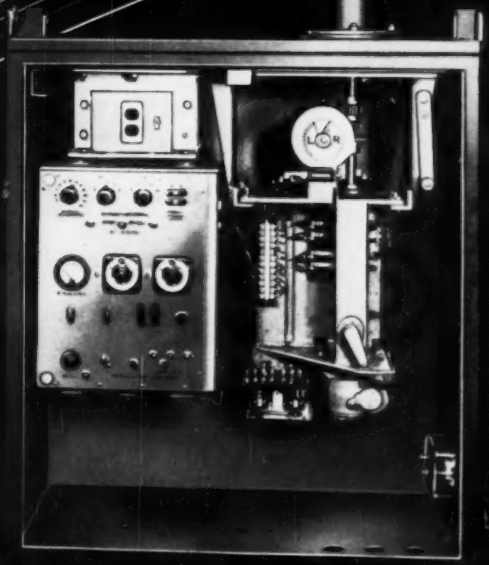
with

WAGNER

LOAD TAP CHANGING TRANSFORMERS

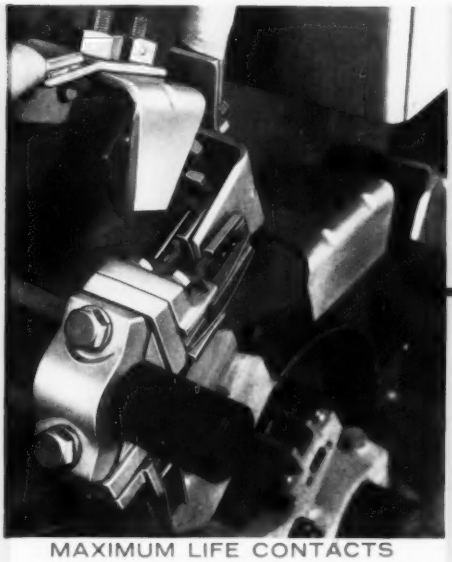






WAGNER LOAD TAP CHANGIN

offers these advantages...

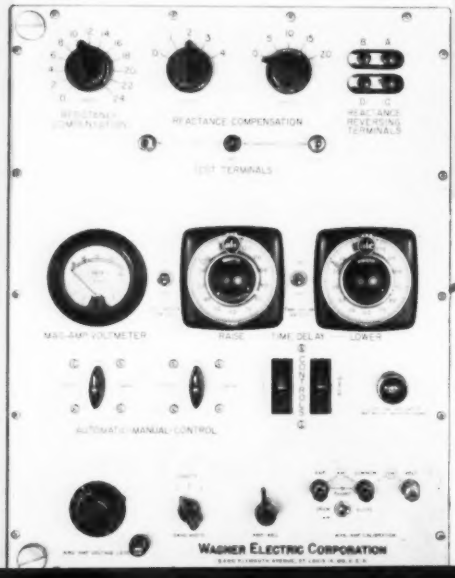


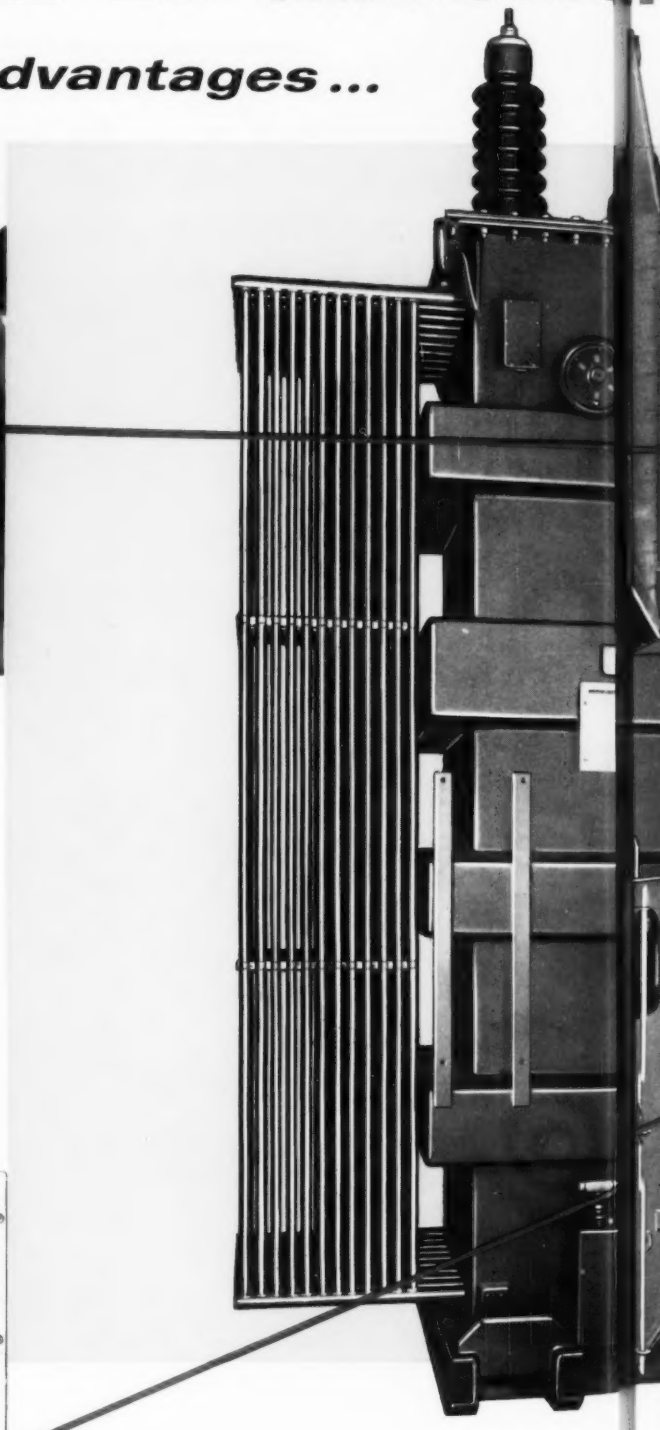
MAXIMUM LIFE CONTACTS

All switch contacts, both moving and stationary, are alloyed copper for maximum resistance to wear... reliability proved by life tests far exceeding normal operating conditions. Moving contacts self-aligning... free parallelogram action assures maximum contact area with constant pressure.

MAGNETIC AMPLIFIER CONTROL

Magnetic amplifier control eliminates moving contacts in the voltage sensing circuit... provides simplified and highly accurate band width control.

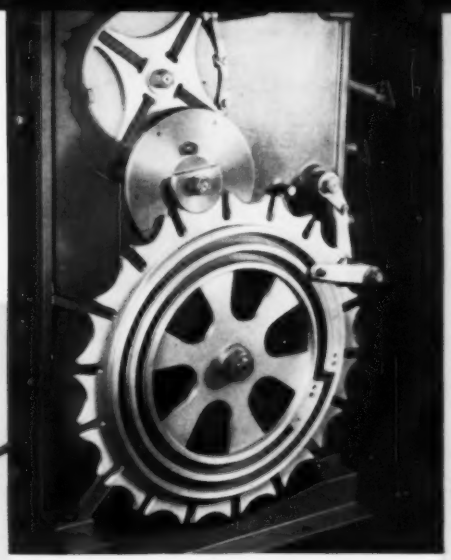




Wagner Electric Corporation

6400 PLYMOUTH AVE., ST. LOUIS 33, MO.

MECHANISM

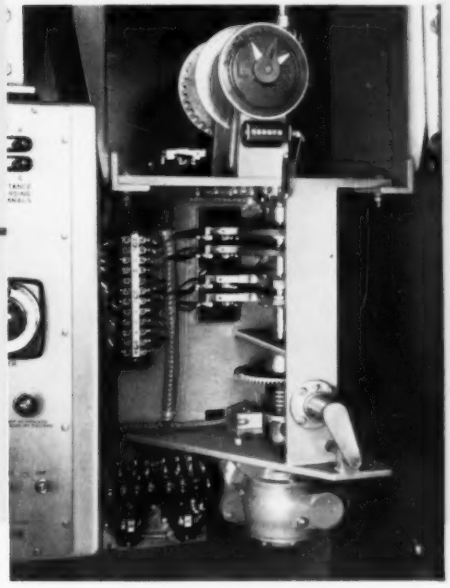


ONLY 2 GENEVA GEARS

The two Geneva gears operate from a single drive pinion, and are designed for 90° entrance to reduce noise of operation. The reversing switch operates from a cam in the face of the tap selector gear which has a positive mechanical stop to prevent over-travel.

SINGLE SHAFT DRIVE

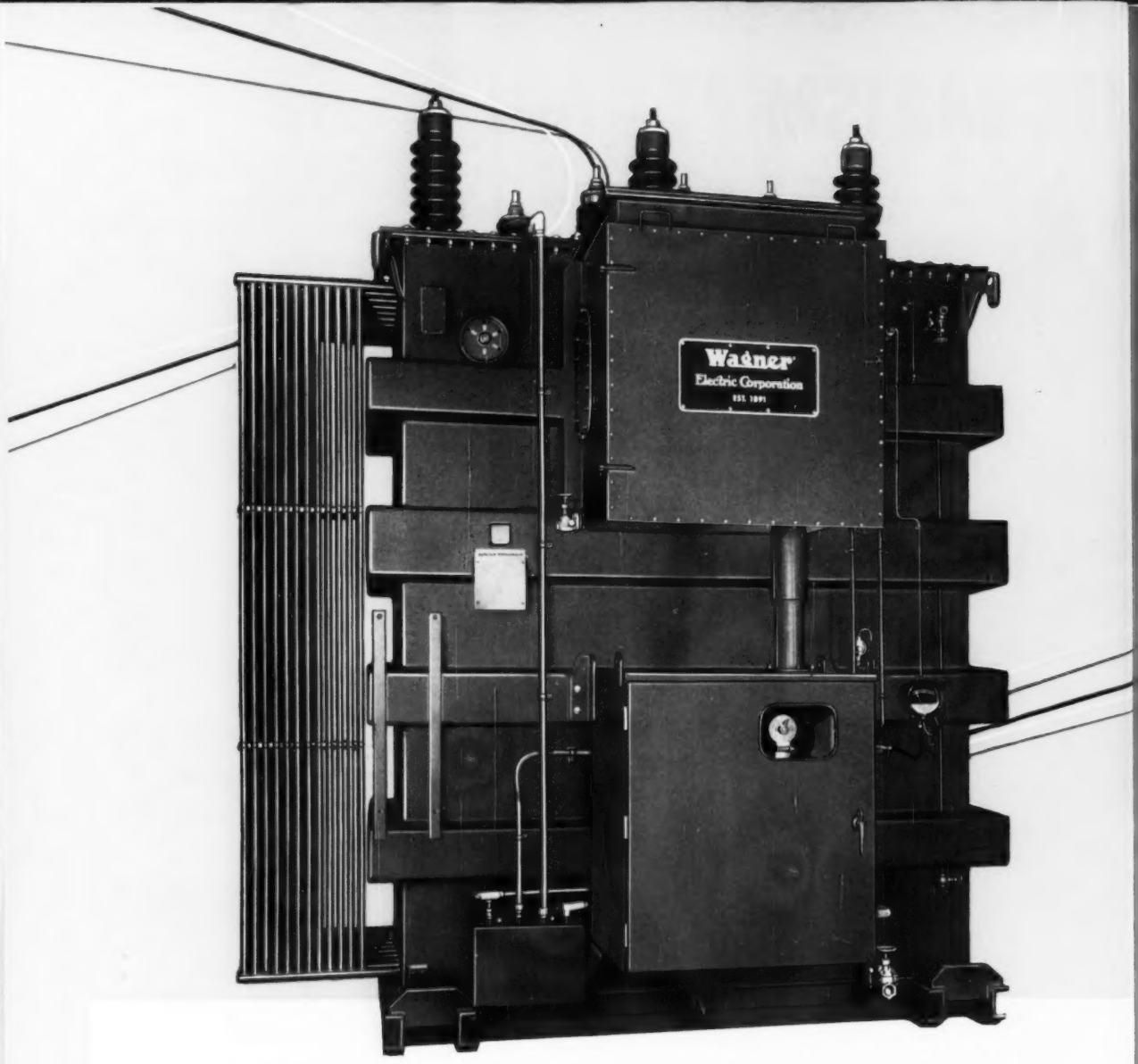
A single main drive shaft, geared to the drive motor and to the drive pinion, operates the tap selector switch and the load transfer switch. This shaft also operates the position locating switches and the position indicator.



Here is a compact, extremely simple power transformer load tap changing mechanism, using a single drive shaft and one set of miter gears to assure quiet operation.

Magnetic amplifier control means higher accuracy in the voltage sensing circuit, and greater reliability since no moving parts are necessary.

The design simplicity of the Wagner load tap changer . . . in the drive mechanism, the transmission assembly, the switches and the control circuit . . . results in long, efficient operating life with freedom from maintenance.



WAGNER LTC POWER TRANSFORMERS

Wagner Load Tap Changing Power Transformers are designed and built to meet the most exacting requirements of modern utility companies. The mechanism is unusually simple, to give users the benefits of longer operating life—quiet operation—and freedom from maintenance.

Wagner Load Tap Changing Transformers can be built in all popular kva and voltage ratings to meet your requirements.

Constant research and development have kept Wagner up front in transformer design for more than 65 years—made the name Wagner one of the foremost in power planning.

For full information on these Load Tap Changing Power Transformers, consult your nearby Wagner Sales Engineer. There are Wagner branches in 32 principal cities.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

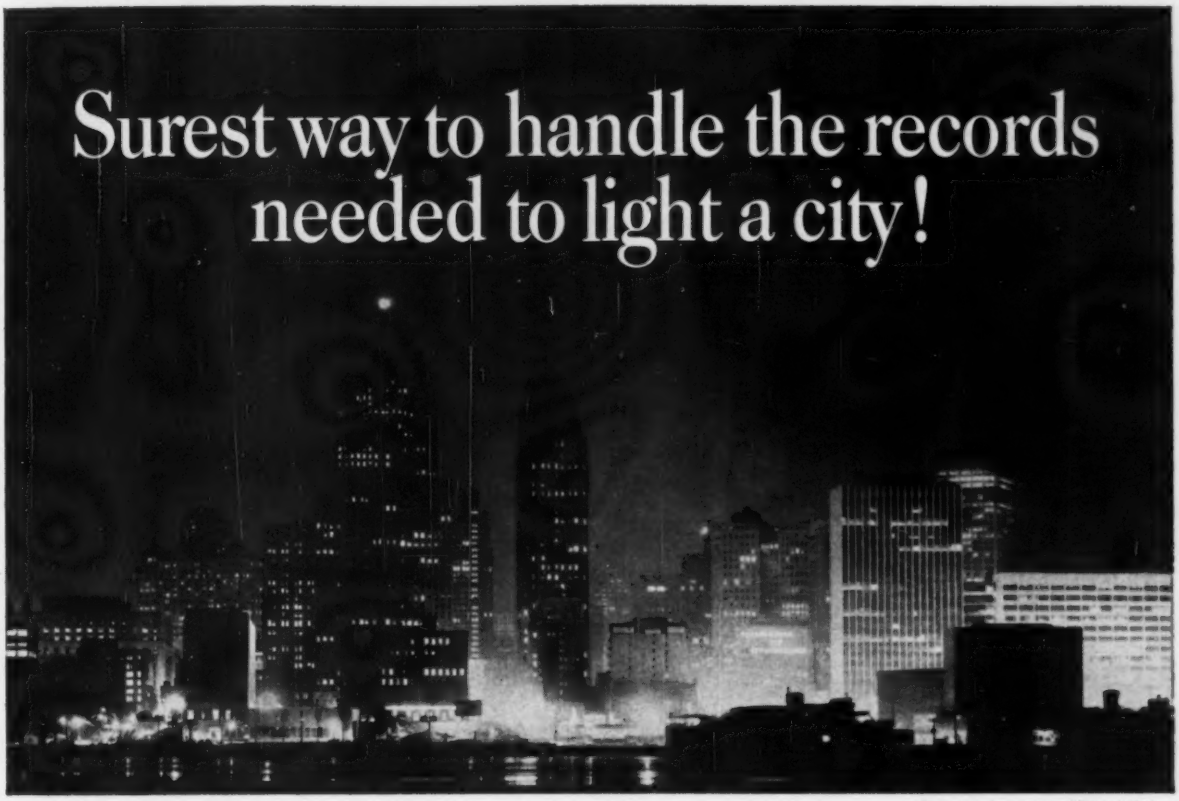
LIVE BETTER ELECTRICALLY

Wagner Electric Corporation

6400 PLYMOUTH AVE., ST. LOUIS 33, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . *ELECTRICAL* . . . *AUTOMOTIVE*

Surest way to handle the records needed to light a city!



Photograph courtesy of Detroit Edison

Recordak Microfilming speeds paper work, increases protection for about 200 public utilities

"How to prepare records *fast* . . . keep them in *less space* and still follow the Federal Power Commission's regulations concerning the preservation of records! How to do all this and keep clerical *costs down!*"—these are problems every utility faces today. *And it's here that Recordak Microfilming helps immeasurably!*

This low-cost photographic process speeds clerical routines in billing, accounting, engineering, personnel—and on jobs where you never thought microfilming could help. For example, in Detroit Edison's Meter Department, Recordak Microfilming has cut transcribing chores in half. Here's how:

Instead of posting by hand all the results of more than 100,000 meter tests made each year, the original test reports are *photographed* with a Recordak Microfilmer—easy, fast, accurate!

The Recordak Reliant Microfilmer

Detroit Edison also microfilms its vital engineering drawings and construction records. This has cleared its files of more than 50,000 bulky original drawings and documents. Makes reference faster. Takes only a minute, now, to look up any item with a Recordak Film Reader. And what Detroit Edison saves in insurance costs, alone, more than pays for the microfilming.

Learn how you can eliminate transcribing and filing on job after job with Recordak *and gain added protection for all your vital records.* Mail coupon for details and free folder on the Recordak Reliant Microfilmer, illustrated below. This unique machine even *indexes* films while you microfilm.

"Recordak" is a trademark

RECORDAK

(Subsidiary of Eastman Kodak Company)

originator of modern microfilming—

now in its 32nd year

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Send me details on public utility savings with Recordak Microfilming; also details on the Recordak Reliant.

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Utility_____

Street_____

City_____ State_____

NAUGATUCK PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER

Now—the finest weather-resistant wire jackets can be Colored!

FOR SALES APPEAL • FOR SERVICE EASE

New Paracril OZO—a superior rubber compound developed by Naugatuck—makes possible *new eye appeal, new ease of identification.* And it outperforms standard wire jacket compounds many other ways, too!

Compare new PARACRIL OZO with other wire jacket rubbers. Prove for yourself new PARACRIL OZO gives:

- significantly superior ozone resistance
- greater fuel and oil resistance
- much greater abrasion resistance than standard jacket compounds
- excellent processability, with particularly fast extrusion
- *permanent retention of bright colors!*

If you are not already using PARACRIL® for your wire jacket compounds or similar products requiring such properties, chances are 1000 to 1 it's because you haven't yet *tried* PARACRIL OZO.

Why *not* try it—soon. Contact your nearest Naugatuck representative at the address below.

Naugatuck Chemical

Division of United States Rubber Company 913P Elm Street Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

Since 1946
the City of Chicago
has installed...

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UNION METAL STREET LIGHTING POLES

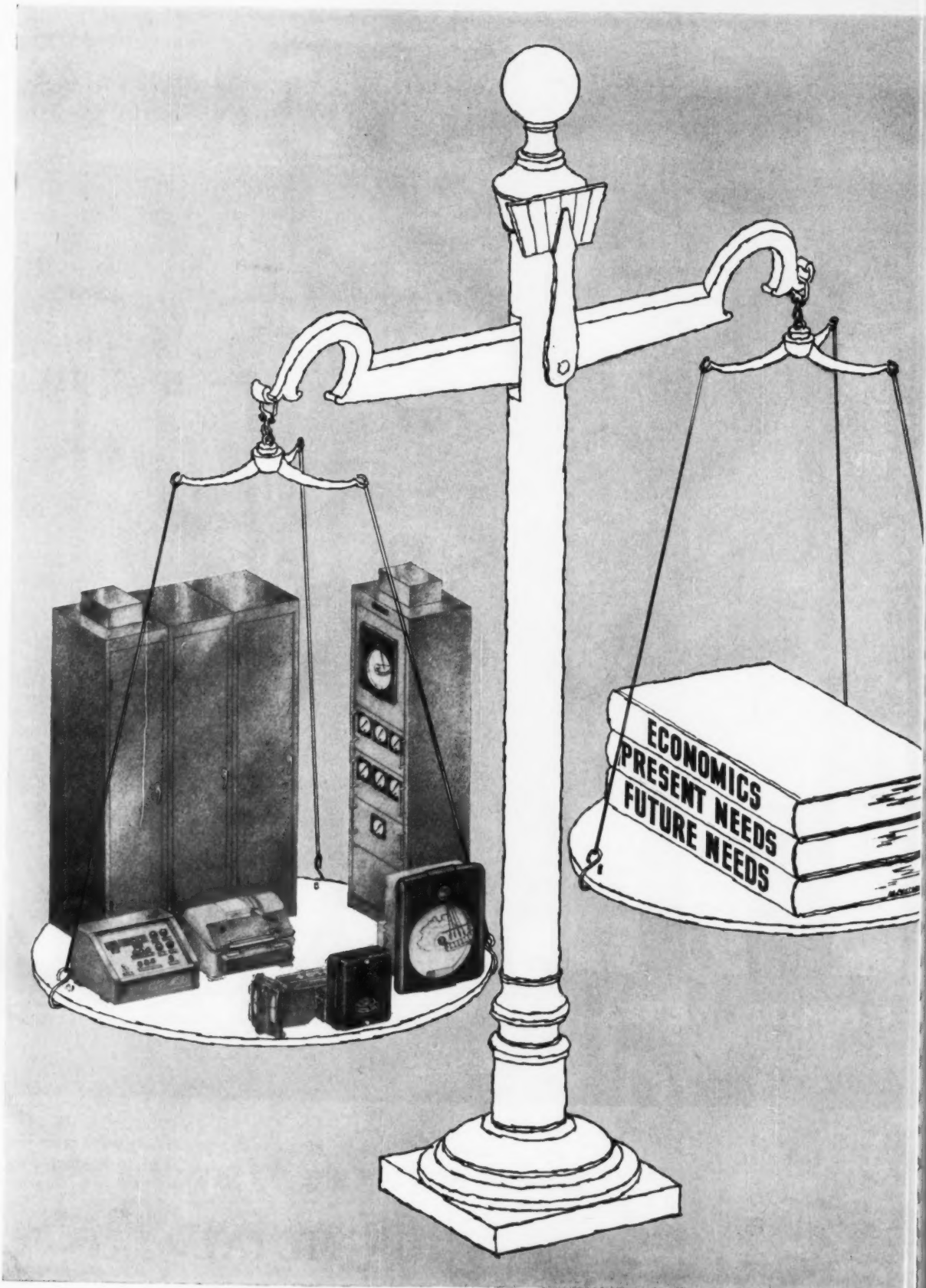
Experience, acceptance, attractive design—these are the reasons why Union Metal is first in lighting pole sales throughout the nation.

Monotube Lighting Poles

UNION METAL

The Union Metal Manufacturing Co.

Canton 5, Ohio • Brampton, Ontario, Canada


ECONOMICS
PRESENT NEEDS
FUTURE NEEDS

BAILEY

BALANCES ALL THESE FACTORS TO HELP YOU REACH OPTIMUM PERFORMANCE

Bailey takes a sensible systems approach by analyzing the immediate and future needs as well as the control economics of your complete process.

Backed by 40 years' experience in the field of measurement and control, Bailey engineers can insure that your system will have the proper balance both as to economics and needs . . . that there will not be the unnecessary expense of over-instrumentation or control . . . nor the duplication of equipment functions.

To effect this approach, Bailey offers a complete line of process and power system components:

Equipment—Primary sensing devices, indicators, recorders, loggers, control units, panels, data-handling equipment and computers for performance analysis, and supervisory controls.

State-of-the-Art—Conventional and sophisticated designs ranging from mechanical, pneumatic and electric thru electronic and solid-state.

Because all of these components are *standardized and compatible*, you have building block flexibility. You can add to your system as the need arises for more control or analysis.

Our complete line gives you one-source buying . . . one responsibility . . . qualified systems engineering . . . fast service . . . experienced field assistance on one instrument or on a complete system. Call our nearest office or write for information today.

G150-2

Instruments and controls for power and process

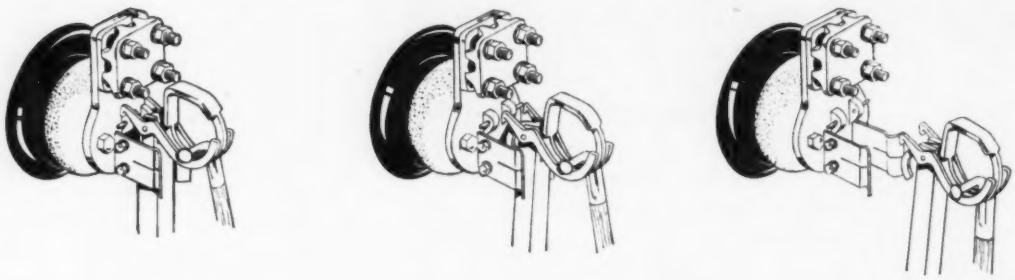
BAILEY METER COMPANY

1060 IVANHOE ROAD • CLEVELAND 10, OHIO

In Canada—Bailey Meter Company Limited, Montreal

TECO Hook-Operated Disconnect Switch

*EASY-TO-OPEN IN ANY KIND OF WEATHER HERE'S FULL PRY-OUT ACTION



Here's a disconnect switch your linemen will have no trouble operating — even in the dead of an ice-packed night.

No matter what the hour, any lineman can quickly locate large, white pull ring. It's treated with a special weather-resistant paint that reflects the outline of the pull ring at night.

And ice or corrosion is no problem when it comes to opening this new TECO disconnect. The illustrations (above) show its full pry-out action which assures easy opening under any weather conditions.

PLUS . . . A rugged, one-piece blade formed from square copper tubing that will withstand 150 pounds of side thrust without distortion. Heavy-duty, double blade stops that arrest blade at 90 degrees in the open position. Positive double latching when blade is closed. Silver buttons on hinge and clip contacts for greater conductivity. Connectors are plated for copper or aluminum conductor.

ALL TECO hook-operated disconnect switches comply with NEMA specifications for heat rise, surge currents, center distances and insulators. Double hooks can be furnished for load interrupting hot-stick. Switch is available from 5 KV through 69 KV in 400, 600 and 1200 amps.

Ask your TECO sales representative about this great new idea in a disconnect switch — or write today for bulletin 801.

TURNER ELECTRIC CORPORATION

9510 ST. CLAIR AVENUE EAST ST. LOUIS, ILLINOIS

Complete line of air-break switches, dead-end band brackets, flexi-band and thru-bolt cluster transformer brackets.

Announcing... NEW

YORK-HOOVER "Bobcat"

LINE CONSTRUCTION BODY

featuring MORE STABILITY

where HEAVY LOADS are handled by THE DERRICK

6 COST-SAVING FEATURES

GALVANNEAL STEEL CONSTRUCTION
superior corrosion resistance

HEAVY DUTY BASE
provides maximum strength and rigidity

SIDE BOXES
arranged for quick access to tools and materials

DOORS
rigid, sag-free, low maintenance

SUPERSTRUCTURE ASSEMBLY
low, compact, easy loading

DERRICK AND DIGGER EQUIPMENT
wide variety, tailored to your needs

GET ALL THE FACTS ABOUT THE "BOBCAT"

CLIP AND MAIL TODAY!

Dept. E, York-Hoover Corporation
York, Pa.

Gentlemen,

Please send us a copy of Bulletin No. 948 covering your new "Bobcat" Line Construction Body.

Name_____

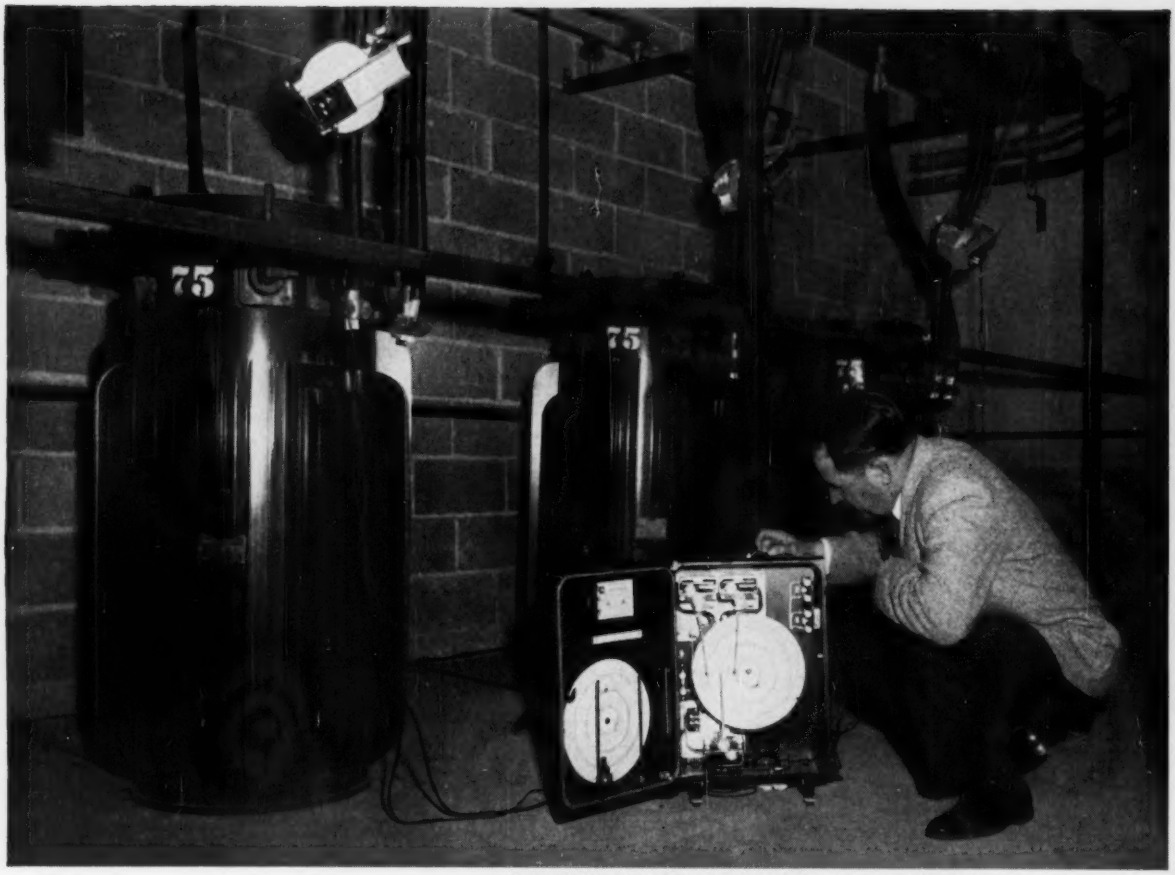
Company_____

Address_____

City and State_____

Creative Engineering for the Public Utility Industry Since 1892

YORK-HOOVER CORPORATION, YORK, PA.



NEW BRISTOL 3-PEN AMMETER ideal for checking balance in 3-phase system.

1-, 2-, now 3-pen Bristol Ammeters

EXTREMELY COMPACT, the Bristol 641 "folded-chart" ammeter is available in 1- or 2-pen models.

You can record up to 3 related or independent currents on one Bristol instrument (similar voltmeters available)

Bristol's recording ammeters now can have as many as 3 independent moving iron elements.

These are the same rugged, stable, high torque, low burden elements that have earned Bristol ammeters such a reputation for accuracy and dependability on utility and industrial applications. For fixed installation, ammeters come in models for flush-panel mounting, surface-panel mounting or interchangeable surface or flush-mounting with either terminal stud or conduit connections. Units also come in a portable model and a portable or pole mounting model. And look at these big features:

Accuracy—1% of scale.
High actuating torque—gives positive recording. Leveling not critical.
Low electrical burden—5VA at 5 or 10 amps.
Stability of calibration—field calibration (seldom required) easily done without special skill or tools.
Rugged construction—shock proof bearings. Pen locks for transport.

Write for complete data on Bristol 1-, 2-, or 3-pen recording ammeters or voltmeters. The Bristol Company, 116 Bristol Road, Waterbury 20, Conn.

B-11

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

208 American Bridge Towers with spans up to 3,345′

carry Kentucky Utilities' new 138-kv line through rugged mountains

Kentucky Utilities Company, a customer since 1918, recently bought 208 more American Bridge towers for its new Richmond-Lynch 138-kv line. Running through rugged mountainous area, these towers vary from 60 to 75 feet in height. *The longest span is 3,345 feet.*

The single-circuit line is made up of three 556 MCM A.C.S.R. conductors and two 7/16″ steel overhead ground wires. The weight of each tower is about six tons, making a total weight along the entire line of nearly 1,300 tons. USS MAN-TEN steel was utilized in these towers at critical points where greater strength was required.

If you are unfamiliar with American Bridge tower service, an inquiry will bring detailed information. We have the experience, the engineering know-how, and the fabricating facilities to design and build any type of steel tower to meet your requirements.

USS and MAN-TEN are registered trademarks

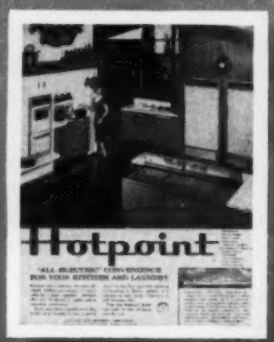
American Bridge Division of USS **United States Steel**

General Offices: 525 William Penn Place, Pittsburgh, Pa. Contracting Offices in: Ambridge · Atlanta · Baltimore · Birmingham · Boston · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Elmira · Gary · Harrisburg, Pa. · Houston · Los Angeles · Memphis · Minneapolis · New York · Orange, Texas · Philadelphia · Pittsburgh · Portland, Ore. · Roanoke · St. Louis · San Francisco · Trenton · United States Steel Export Company, New York

ONLY HOTPOINT

BACKS THE BIG MILLION-DOLLAR MEDALLION HOME LIFE SPECTACULAR IN THESE 3 IMPORTANT WAYS

1.

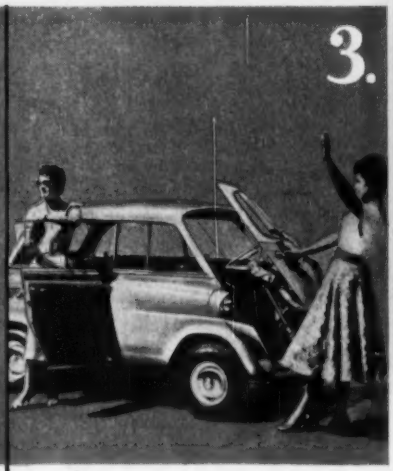


HOTPOINT FULL-COLOR ALL-ELECTRIC KITCHEN AD in the Medallion Home section of the September 14th issue of LIFE magazine.

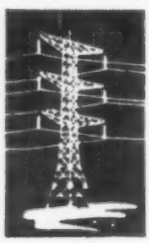
2.

HOTPOINT MERIT AWARD provides advertising and display material, kitchen planning, plus other special merchandising support to builders who include Hotpoint electric kitchens in their Medallion Home models.

3.

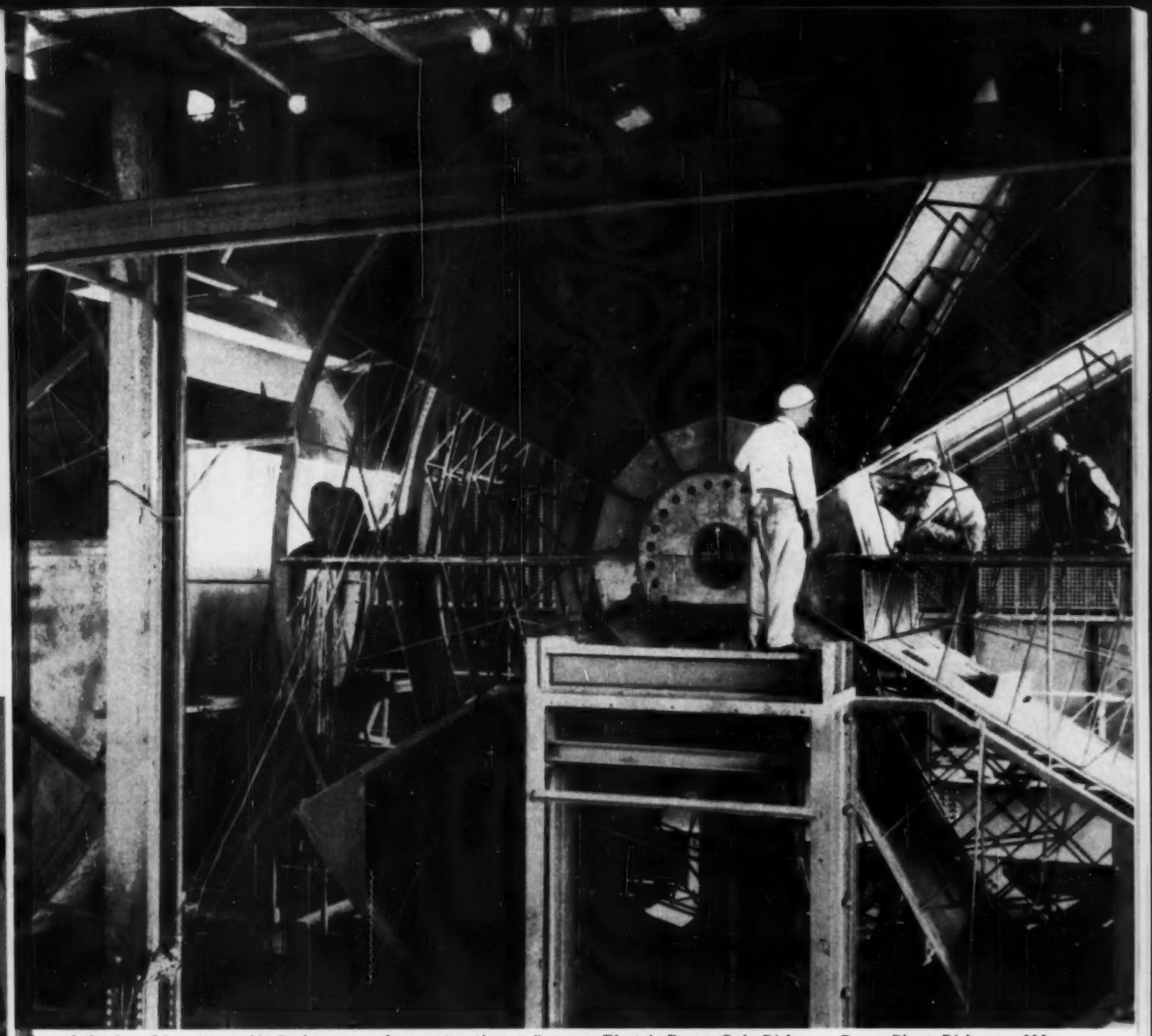


HOTPOINT HONOR HOME PROGRAM awards 2 Isetta cars to builders who do the best job of merchandising Hotpoint electric kitchens in their model homes.



LOOK FOR THAT **Hotpoint** DIFFERENCE

A Division of General Electric Company, Chicago 44, Illinois



Two of the four Ljungstrom Air Preheaters under construction at Potomac Electric Power Co.'s Dickerson Power Plant, Dickerson, Md. Each pair of these Ljungstroms, with a combined heat exchange surface of 475,000 sq. ft., will serve one boiler, evaporating 1,300,000 lbs of steam/hr. The first 175,000 KW unit was placed in operation in June this year and a duplicate unit is now under construction.

IR PREHEATER SERVICE

PROTECTS POTOMAC ELECTRIC POWER CO.'s NEW **LJUNGSTROMS®** TWO WAYS

om the moment they start—and as long as they operate—these ungstroms will get double-header ir Preheater service: protection inst routine wear, and insurance maximum operating efficiency. is is how.

ime Air Preheater Service pro-es regular inspection and the serv-s of expert technicians throughout life of each unit. Air Preheater neers make personal calls at least e a year on every Ljungstrom allation to make sure that all units are in top condition. This type of service is still in effect on Air Preheaters dating from 1923.

Rapid factory service gives the best possible protection against routine wear, the best insurance of readily-available replacement parts. In one typical case, an Air Preheater customer 500 miles from the factory received *custom-fabricated* parts within ten hours after his initial request for these parts.

Regular inspection and fast response to emergencies are just two advantages Air Preheater offers its customers. Another is expert knowledge of boiler and preheater problems, gained through 35 years' experience. These reasons—knowledge of our customers' problems and a *continuing* interest in them—probably explain why nine out of ten preheaters sold today are Ljungstroms.

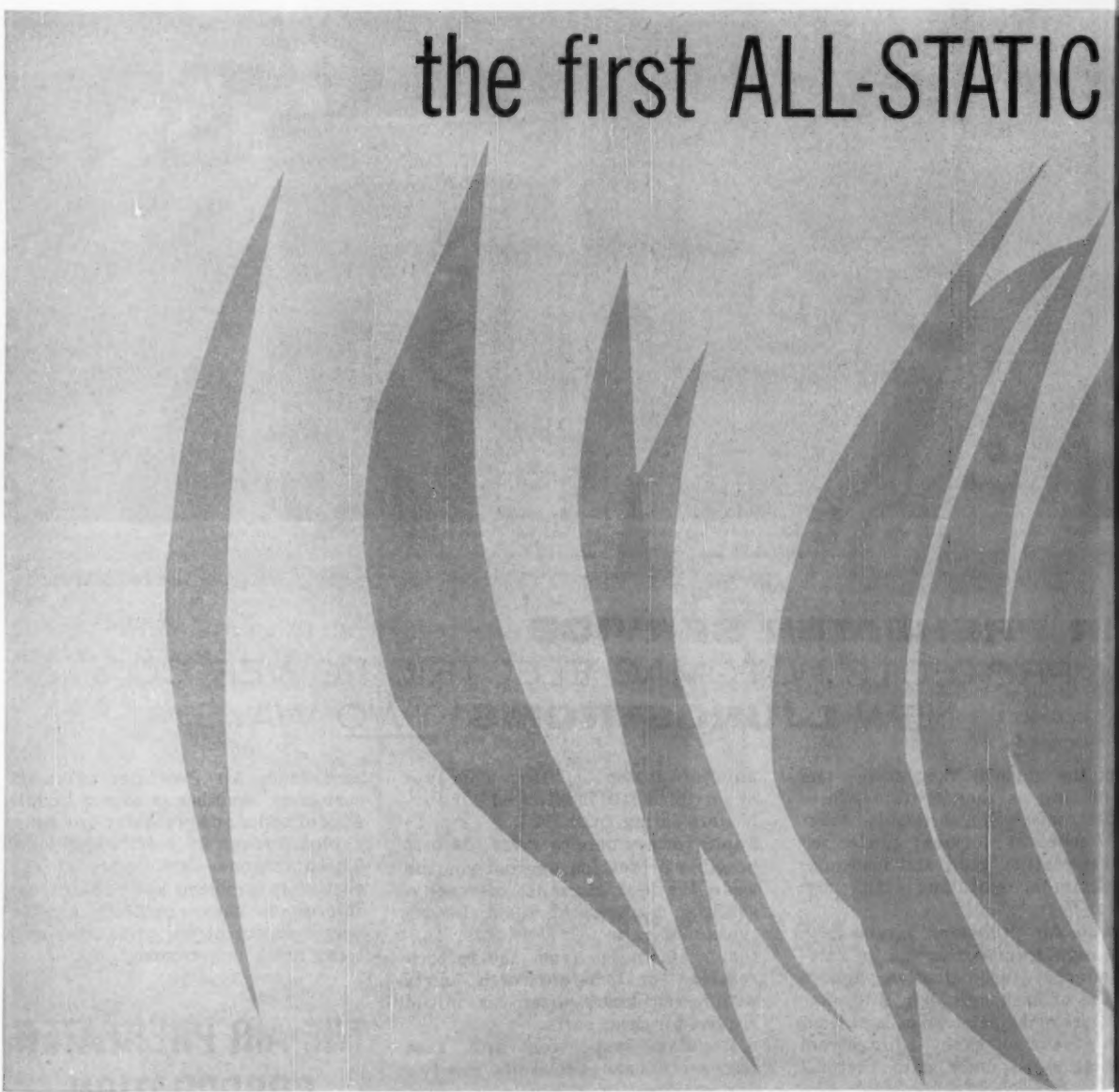
THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

The new Type SA represents a promising start toward realizing the potential advantages that abound in the use of semi-conductors. Based on 21 years of study and experience in static-relaying circuitry that started with our Type HCB relay in 1938, the SA holds promise for low maintenance, better sensitivity, lower op-

WESTINGHOUSE

the first ALL-STATIC



erating energy and more compact construction. Faster response will be limited only by the time required for integration (the thinking and command function).

Protective relaying took a long stride forward with the development of this new Westinghouse 3-phase relay for generator protection.

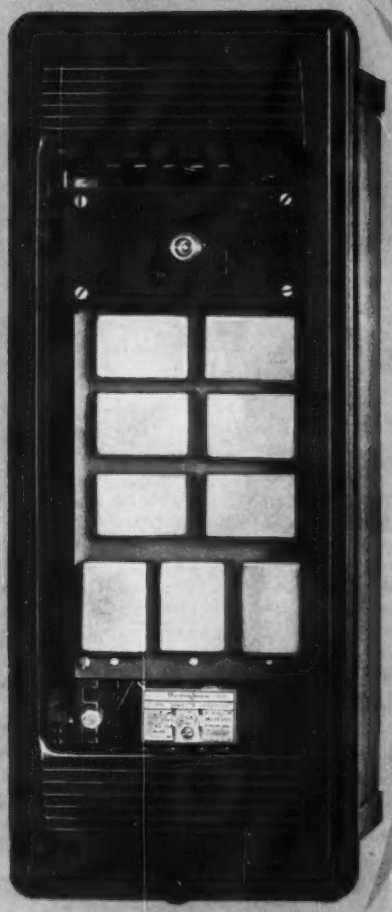
Call your Westinghouse sales engineer to get the story on our work in the field of statics and protective relaying. J-40527

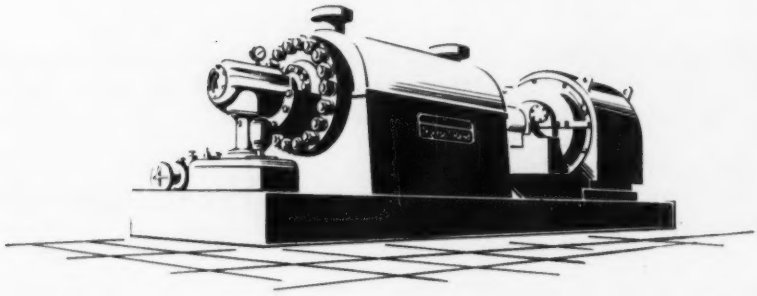
YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS CBS TV FRIDAYS

ANNOUNCES THE SA

differential generator relay





superlatives

that demonstrate confidence in a high-pressure boiler-feed pump and its builder

LARGEST CAPACITY ..... *7200 gpm.* Two record-breaking 7200-gpm pumps with discharge pressure of 4550 psig, for two 450,000-kw generating units.

HIGHEST PRESSURE ..... *6500 psig.* Two half-capacity units, each consisting of three pumps in series, with discharge pressure of 6500 psig, for a 325,000-kw station.

HIGHEST HORSEPOWER ..... *23,000 hp.* Two large capacity, high-head pumps, each driven by a 23,000-hp steam turbine, largest ever built for boiler-feed service.

LARGEST GENERATING UNIT ..... *500,000 kw.* Two turbine driven half-capacity pumps, each handling 4000 gpm at 3108 psig discharge, at 6600 rpm for world's first half-million kw generating unit.

GREATEST ACCEPTANCE ..... *Ingersoll-Rand* has built far more high-pressure boiler-feed pumps than any other manufacturer — including many *high-speed* units for generating stations. These superlatives demonstrate industry's confidence in I-R Class CHTA pumps, and in Ingersoll-Rand's ability to design and build to any requirements — even those that go beyond previous industry experience. For maximum dependability and long-range economy, specify boiler-feed pumps by Ingersoll-Rand.

Ingersoll-Rand

10-975 ♥ 11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS & DIESEL ENGINES • PUMPS • AIR & ELECTRIC TOOLS • CONDENSERS • VACUUM EQUIPMENT • ROCK DRILLS

SEATTLE CITY LIGHT'S 230/26-kv Duwamish Substation uses Southern States 34.5 kv-3000 amp Type WAG Switches with Amplitact Contacts.

The Man-sized Switch for Man-sized Jobs

FIG. 1

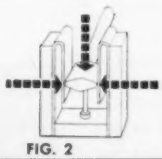


FIG. 2

AMPLITACT® CONTACTS ON WAG

High pressure Amplitact contacts provide maximum dependability under high current short-circuit conditions. The arrows in Fig. 1 show direction and relative magnitude of electromagnetic forces induced when switch is subjected to fault current.

The resultant electromagnetic forces, as shown in Fig. 2, greatly increase contact pressure and positively hold blade in the engaged position. For complete details, write for Bulletin 56AM on the Amplitact.

"Don't send a boy to do a man's job" is a saying especially applicable when choosing switchgear that must safely carry 3000-4000 amperes. Not only must it be capable of carrying such loads after years of service, but it may be called on to withstand fault currents up to 120,000 amperes without damage.

It's a man-sized job. Dirt, industrial waste, years of exposure to every type of contamination make the job even tougher. It takes a man-sized switch!

The Type WAG illustrated above is a good example. It's big and tough enough to carry its rated load continuously without excessive temperature rise. A built in safety factor more than compensates for the deteriorating effects of long, hard service. Amplitact® contacts provide high pressure for handling the heaviest faults.

The WAG is finding wider and wider acceptance in all ratings. It's now in service in virtually every state in the union.

Get complete details from your Southern States representatives or write direct for our latest bulletin.

LIVE BETTER ELECTRICALLY

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

Along today's modern highways easy-to-handle J-M Transite Ducts provide installation economies and years of service life, protecting traffic-signal, lighting, and other power-service circuits.

J-M Transite® Ducts install fast to last... give complete cable protection.

Because speed and economy set the pace in today's highway programs, more and more highway cables are going into Johns-Manville Transite Ducts.

For speed, Johns-Manville Transite Ducts are strong, light and long—easy to handle and install. Workmen set 10-foot lengths in place easily, join them up tight in seconds with snug-fitting J-M Plastic Couplings, and Transite's smooth bore is free of burrs and other obstructions that may interfere or cause damage during pulling of cables.

For economy, J-M asbestos-cement Transite Ducts go in to stay. Non-conductive Transite is not affected by electrolysis—resists the corrosive action of fills or high-salt soils in permanently damp locations. Millions of feet of installed Transite Ducts have proved that Transite withstands earth loads and soil stress . . . resists vibration and shock from highway traffic.

Let us send you free Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

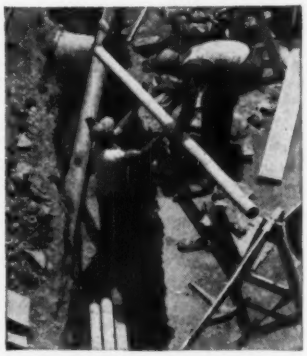
JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE Transite Ducts

Made of Asbestos-Cement

J-M Conduit for direct buried banks and exposed runs

J-M Korduct® for concrete banks



Johns-Manville Asbestos Transite Ducts can be laid directly in trench without concrete envelope or other mechanical protection.

Now from UPTEGRAFF

. . . new distribution transformers

completely modern . . .

with a comprehensive design that means

BETTER PROTECTION

TOP PERFORMANCE

GREATER DEPENDABILITY

No other transformer has all these features

- Light-weight construction
- High rag content fuller board insulation
- High-temperature, film-covered magnet wire
- Uniformly-compressed cover gasket
- Rust-proof cover band
- Pressure tested
- Plastic-coated covers
- Hand-welded lifting and mounting lugs
- Keyed bushings and terminal hardware
- Electronic monitoring of impulse tests
- Inhibited oil
- Flow-coat painted

Some manufacturers have some of these features but you can get them all—only in . . .

UPTEGRAFF (Pole Type) **TRANSFORMERS**

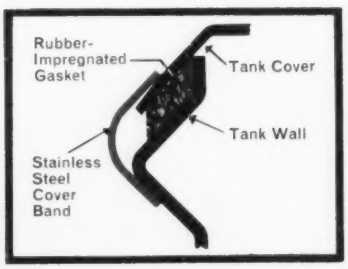
Costs you no more to get all these features with UPTEGRAFF

DISTRIBUTION (Pole Type) TRANSFORMERS

Only the Uptegraff comprehensive design offers you *all* these features—some exclusively. They are standard on all Uptegraff pole type distribution transformers—Askarel or oil immersed. In addition, a complete line of accessory equipment is available—including protected-type bushings, lightning arrestors, thermal overload circuit breakers and overload indicators. For complete engineering details, contact your Uptegraff representative or write us at Scottdale, Pa.

Air, moisture and all other contaminating influences are positively LOCKED-OUT by cover band arrangement

Designed to provide a uniform seal, a one-piece stainless-steel band with bronze bolts and nuts firmly compresses a rubber-impregnated cork gasket between the parallel surfaces of the tank cover and tank wall—preventing entrance of all air and moisture. It's easy to tighten, remove, reinstall.



Resilient, rubber-impregnated gasket. Uniform, controlled and retained compression is assured by a diamond-shaped Buna N rubber-impregnated cork gasket. This specially designed material is deformable, resilient and compressible, a unique combination of characteristics which assures positive sealing and permits frequent removal of cover. It does not take a permanent set, retains its resiliency. The gasket is cemented to the tank surface and silicone-grease treated on the cover side.

Exclusive pressure test proves seal

Each completed Uptegraff transformer is given a special pressure test with dry air at 3 to 5 psi. At this pressure, by means of pressure differential manometers, the slightest leak is quickly detected. Transformers which will pass the common "inversion" test will not always pass this pressure test. Uptegraff designed a special fitting in the tank wall for this exclusive feature.

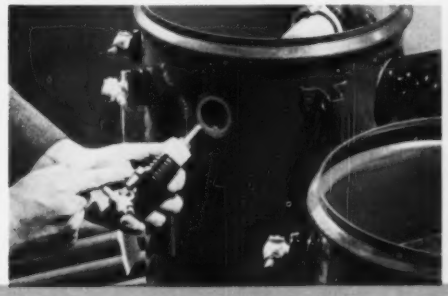
Light-weight construction . . . Grain-oriented cores. Materials are carefully selected and engineered to reduce height and weight. One example is the core. Low core losses and exciting current are assured due to the grain-oriented strip steel in the wound core construction.

High rag content fuller board insulation. Uptegraff uses a high rag content fuller board for coil insulation. This is preferred to the Kraft and modified Kraft paper conventionally used. Corrugated fiber board provides interlayer insulation and cooling ducts. Another coil-winding feature is the use of high-temperature (150°C) film-covered magnet wire instead of paper, cotton or low-temperature film-covered wires.

External flow coat painting. Two coats of flow painting assure uniform thickness of not less than 0.003 inches. Tanks are prepared by shot blasting.

Arc-welded lifting and mounting lugs. Hand arc-welding closes crevises susceptible to corrosion, assures freedom from rusting. Note *under-rolled bottom edge*—which protects bottom weld from rust and when handling.

Keyed bushings, terminal hardware. Prevents gasket damage. Eliminates inadvertent twisting of bushings or terminals when making connections.



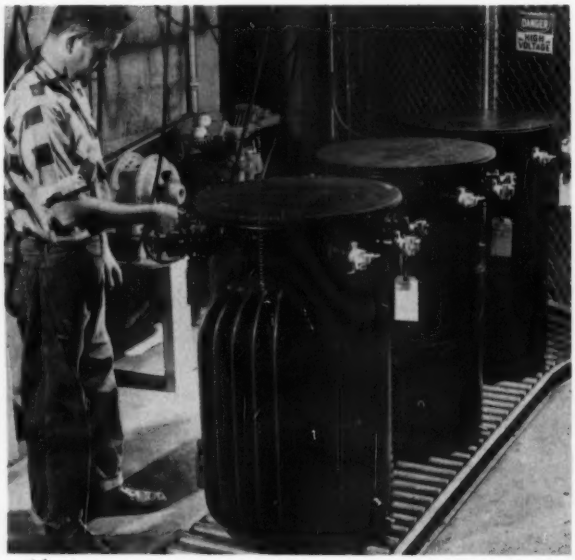
THIS FULL COMPLEMENT OF UPTEGRAFF COMPREHENSIVE DESIGN FEATURES MEAN LONGER LIFE . . . BETTER PERFORMANCE . . . LOWER OPERATING COST

SEALING AND CONSTRUCTION QUALIT

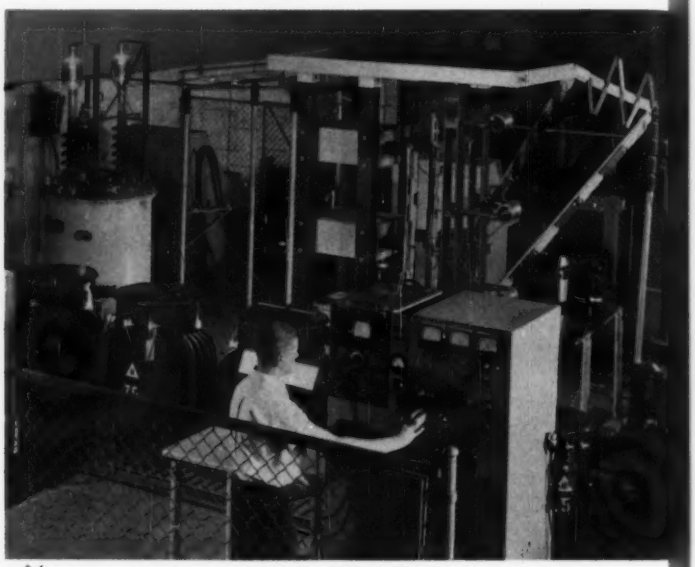
OF UPTEGRAFF DISTRIBUTION TRANSFORMERS . . .

pre-proved by a whole series of production-line tests

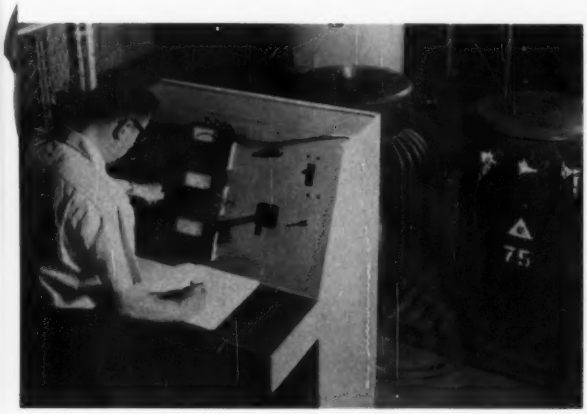
Here are a few of the many operations and tests applied to prove mechanical and electrical integrity



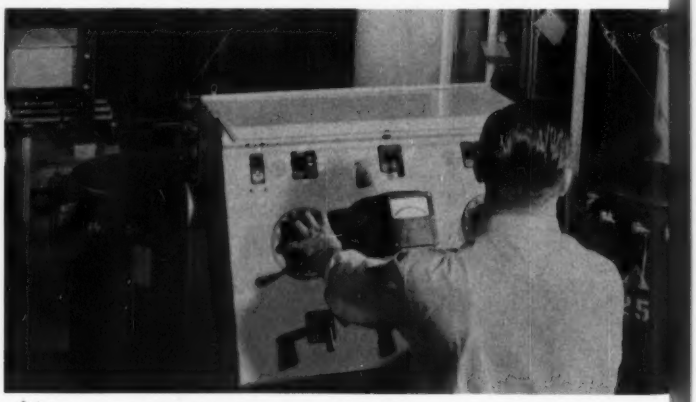
Degassing of Uptegraff transformers is accomplished by drawing vacuum on all units prior to electrical testing. A manifold of 12 vacuum hoses is used for connection to a special fitting on each transformer.



Measuring Insulation Quality under high voltage impulse conditions. This assures capacity to withstand severe lightning induced overvoltages without service interruption.



Checking Core Loss and Exciting Current is one of the many quality control tests which Uptegraff applies to all of its distribution transformers.



High-Potential Tests are given to each winding. Induced voltage tests are also applied to energize transformer to twice its rated voltage. Result: assured, high-quality performance.

Your Nearby Uptegraff Representative will be glad to show you a photographic step-by-step view of our production line and testing equipment. Call him—or write us at Scottdale, Pa.—to arrange an appointment.

R. E. UPTEGRAFF MANUFACTURING COMPANY

Scottdale, Pennsylvania

U
TRANSFORMERS

The contributions C. H. Wheeler's Reverse Flow makes in solving CONDENSER MAINTENANCE PROBLEMS

An informative advertisement from one of the nation's most experienced condenser manufacturers

Since a major condenser maintenance problem is caused by foreign matter, algae and scale which clog tubes and sheets, there is a constant search for better ways to remove this contamination. One of the most successful methods is Reverse Flow (see diagram on right), a system of back-flushing tubes and sheets without shutting down the condenser.

This Reverse Flow design, patented by C. H. Wheeler Manufacturing Company, designer and builder of steam condensers since 1903, has proved itself in installations throughout the world. Here's how it works:

Normal operation is shown on the left. Water enters through inlet A with inside port open, flows through tube bank C to the rear of the condenser. It returns through tube bank D to the front of the condenser and discharges at E.

The right side of the diagram above shows Reverse Flow in operation in a C. H. Wheeler Dual Bank, Divided Water Box Condenser. Water enters through A with outside port open, flows up through channel B and through tube bank D to rear of condenser, returns through tube bank C to front of condenser and discharges at E. Reversing can be accomplished during full load operation and full flow of circulating water, without additional pressure loss. Sluice gates for each half of the condenser move on a common stem. Each half of the condenser can be back-flushed independently; or both halves can be back-flushed simultaneously with one or two circulating pumps operating.

Other Ways To Keep Tubes Clean

Special slugs are sometimes used to remove algae and foreign matter from the insides of condenser tubes. They're forced through the tubes by high-pressure water; thus scale and other contamination is flushed as it's dislodged. When the slugs are metal, care must be taken to prevent ruining them as they fly from the outlet side of the tubes.

Sometimes a 5% HCl solution is introduced into the tubes to dissolve the scale. While this method is effective, it is often necessary to leave the acid in the tubes for six hours or so—thus prolonging down time. Also, it's necessary to flush the tubes before the condenser can be put back in service.

In general, maintenance becomes more of a problem as water-source pollution increases; also as circulating water temperature rises, because the rate of scale formation increases at higher water temperatures.

Solving Deaeration Problems

Oxygen and other non-condensable vapors in the condensate result from leaks or are introduced through make-up water or heater returns. Most authorities believe that the greatest source of oxygen is make-up water.

Make-up water which is not properly heated in the condenser and agitated sufficiently to release entrained gases results in excessive oxygen and other non-condensables in the condensate. As a consequence, corrosive oxides may be deposited in the boiler, reducing its efficiency.

Proper distribution of normal make-up water is achieved in Wheeler condensers by spraying it over the top of the tube banks at both ends of the tubes, and out of the path of high-velocity steam from the turbine exhaust. Steel bars above tubes protect them from water impingement damage.

Heater returns are sprayed in the steam lanes to permit flashing and distribution of the returns and release of entrained gases.

All condensate draining off the tubes is cascaded over a series of horizontal deaerating bars (1, Fig. 3) in the presence of a moving blanket of steam to provide greater agitation and reheating before condensate is drained into the hotwell.

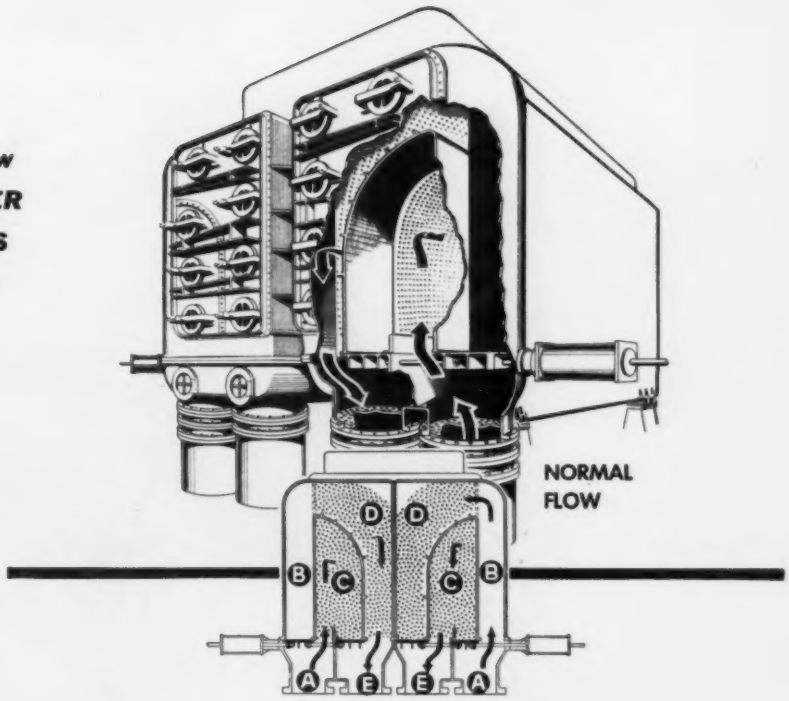


Fig. 1: Simplified diagram showing how Reverse Flow cleans tubes and sheets during full load operation.

Fig. 2: A few of the types of slugs used to clean the inside of condenser tubes.

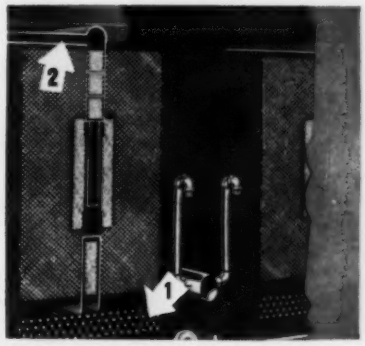


Fig. 3: Drawing of deaerating bars and air-vapor suction line. Tubejet® Air Ejector.

Notice too, location of the air-vapor suction line (2), through which the Tubejet® Ejector draws off non-condensable gases and discharges them to the atmosphere.

In C. H. Wheeler Dual Bank Divided Water Box Condensers the air cooler section is centrally located, so as to reduce depth of steam penetration and consequently resistance to steam passage, achieving a new low in pressure loss in the condenser.

If you have a maintenance problem that doesn't seem to improve no matter what you do, C. H. Wheeler may be able to help. Get in touch with a Wheeler representative or write direct. No obligation.

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pennsylvania

Whenever you see the name C.H. Wheeler on a product, you know it's a quality product.

Steam Condensers • Steam Jet Vacuum Equipment • Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Components

ALOUETTE

MODERN PIONEER OF THE FAR NORTH

Newest bird in the wilds of Alaska and northern Canada is the Alouette, world's first production turbine-powered helicopter. In once-inaccessible corners of our 49th State, as well as in wilderness areas of Canada, the Alouette is doing "impossible" jobs with a minimum of fuss and feathers. As a passenger craft, a utility workhorse, a fire-fighter, an ambulance, and in any role it's called on to fill, the Alouette does its work efficiently, quickly, economically. The Alouette is performing yeoman service for a wide range of industries.*

- *Greatest fuel flexibility: uses JP-1, JP-4, 640 Kerosene, or Diesel*
- *Instant take-off*
- *Simplified controls*
- *Instantaneous power response*
- *Low maintenance time to flight time*
- *Top performance in extreme hot or cold weather*

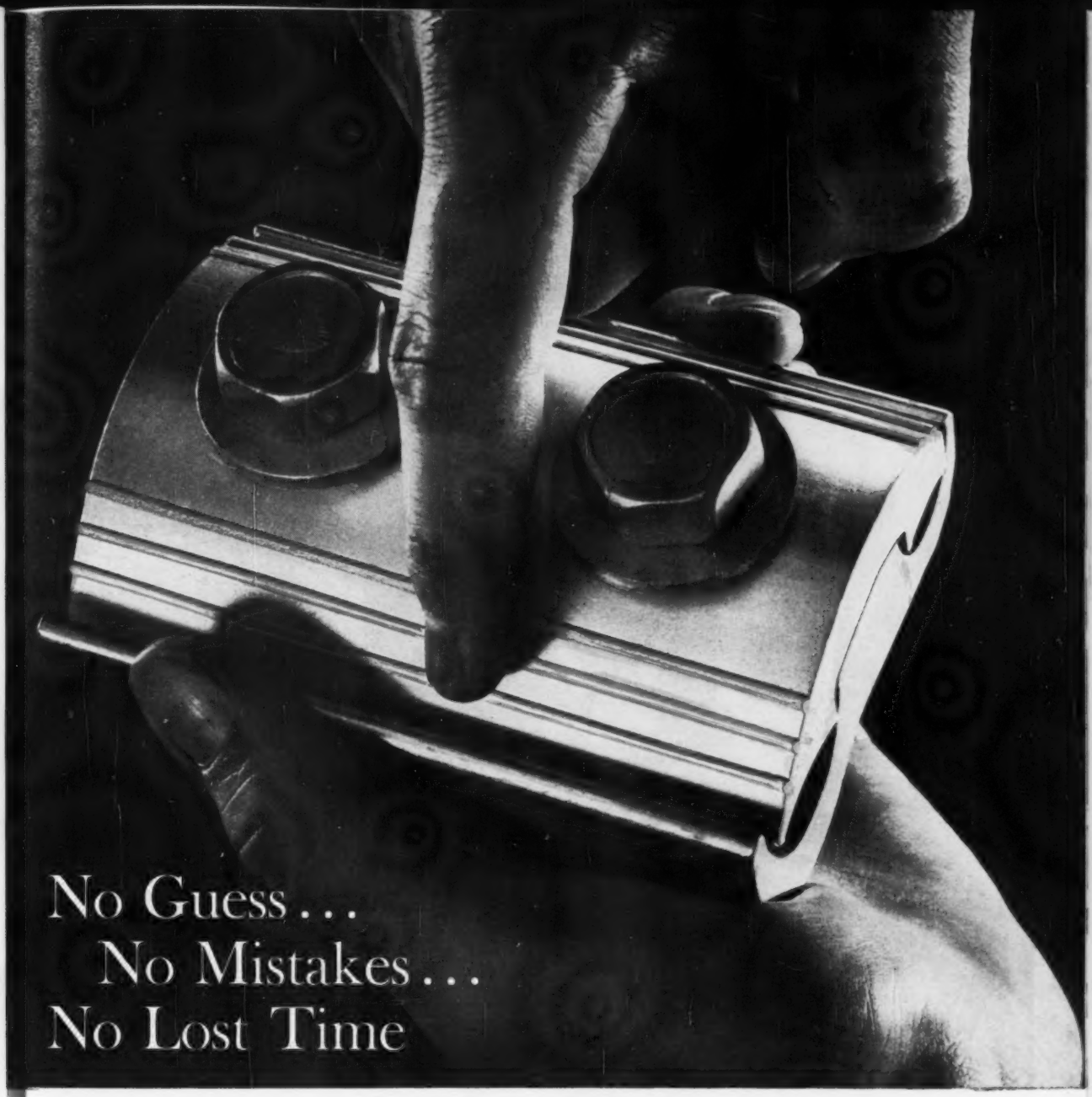
**Designed by Sud Aviation of France*

THE ALOUETTE IS ASSEMBLED, TESTED AND DISTRIBUTED BY:

REPUBLIC AVIATION CORPORATION

HELICOPTER DIVISION

FARMINGDALE, LONG ISLAND, N. Y.



New identification ridges help you pick the right ALCOA CLAMP–every time

An added means of quick, positive identification is now an integral part of Alcoa's series 480 clamps . . . new identification ridges to tell you instantly–by sight or by touch–the right clamp for the right job.

Here's how it works: on each side of the clamp–and the top and bottom –are identification ridges. The number of ridges on each side of the clamp corresponds to the groove size on each side of the clamp. Pick the groove . . . 1 ridge (2-3/0), 2 ridges (3/0-397.5mcm), 3 ridges (397.5-715 26/7). Then by glance or by feel–you *know* you have the right clamp for the job.

Alcoa heavy-duty clamps with universal groove design provide many other advantages which make them your best buy: exclusive "breathing" action for good conductor contact, regardless of thermal changes . . . extruded aluminum for greater strength . . . longer length for more contact area . . . no loose parts . . . can be applied without being taken apart . . . and just three groove sizes cover the conductor range from #2 to 715mcm 26/7 ACSR . . . stranded from #2 to 800mcm.

Next time and every time, call Alcoa. Put the benefits of Alcoa clamps and accessories into your installations. Aluminum Company of America, 2110-J Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

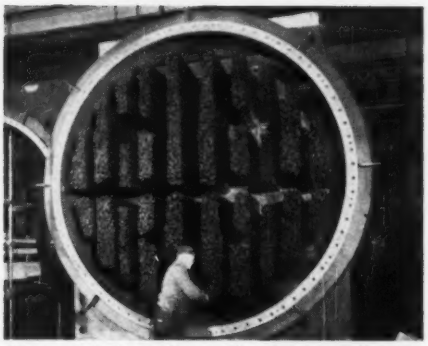
ALCOA ALUMINUM

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

SMALL!

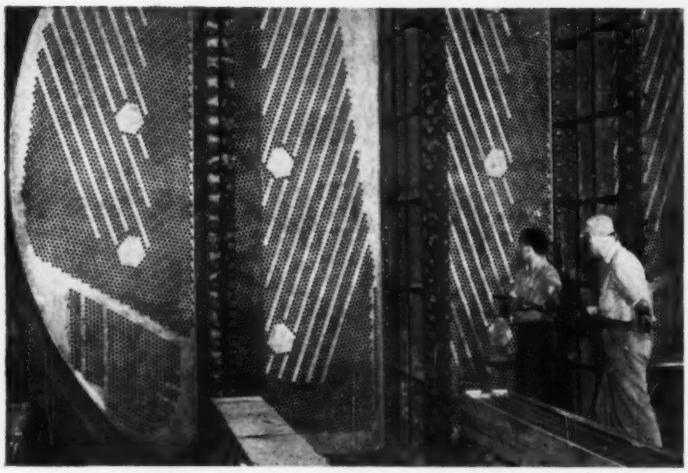
Small tubes like these for oil heaters and coolers are precision-made, give unexcelled service.

BIG!



Chase regularly supplies quality tubes in a wide range of alloys to fabricators of units such as this 25,000 sq. ft. condenser, shown here under construction.

BIGGEST!



Cycles of retubing vast public utility condensers using around 100 tons of tubes are far less frequent when long-lasting Chase tubes are selected.

Chase Heat Exchanger Tube Service Is Complete!

Need a dozen small tubes in a hurry for a replacement job—Or 100 TONS for a new installation? Chase is geared to give you the best possible service in either case. Warehouse and mill stocks enable us to meet emergency schedules. Mill facilities are geared to turn out big orders quickly.

Chase offers one of the most complete selections of condenser and heat exchanger tube alloys to meet any condition, and in a wide range of sizes. We can supply U-Bends, tubes with thickened centers or thickened ends, bi-metal, etc.

Call or write the nearest Chase Warehouse or Chase Sales representative.

Chase BRASS & COPPER CO. WATERBURY 20, CONN.
Subsidiary of *Kennecott Copper Corporation*

THE NATION'S HEADQUARTERS FOR **ALUMINUM • BRASS • BRONZE • COPPER • STAINLESS STEEL AND FORGINGS**

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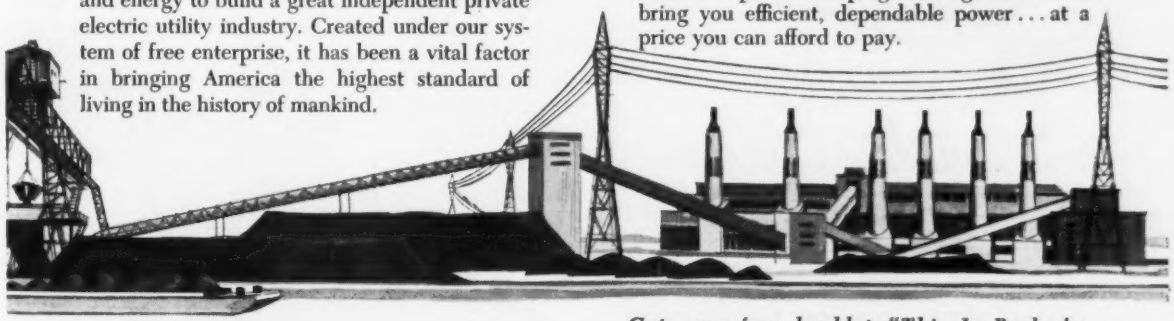
A key on a kite string and a bolt of lightning marked the first step toward the wonders of the Electric Age. Here was power . . . *unlimited power* to drive the machines that produce the necessities and luxuries of modern life at a cost within the reach of all.

This power was unharnessed until a breed of forward-thinking men risked their money, time and energy to build a great independent private electric utility industry. Created under our system of free enterprise, it has been a vital factor in bringing America the highest standard of living in the history of mankind.

The citizens of this country have every reason to appreciate and support this great basic industry.

Coal generates more electricity than all other fuels and water power combined. Peabody Coal Company supplies coal to many of the nation's leading electric utilities. Peabody is pleased to have this part in helping these great utilities bring you efficient, dependable power . . . at a price you can afford to pay.



Get your free booklet, "This Is Peabody Coal Company," and learn more facts about PEABODY and its complete coal service. Write Department EW.

power for progress

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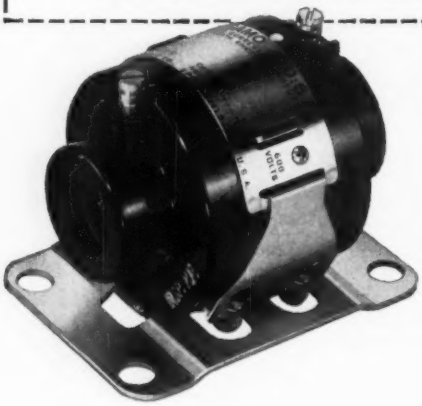
Developed to Meet Your Needs:

A Complete Line of CURRENT TRANSFORMERS to accurately measure loads from 20 to 1600 Amperes

Type BH Transformers

Single or Dual Range—Completely Color Coded

Sangamo Type BH (Big Hole) Transformers come in single range 200 to 800 ampere ratings and in the unique dual range 200/400 or 400/800 ampere ratings that reduce transformer changeouts. BH Transformers provide more cable space—more installation room—easier cable insertion. They are molded in colored epoxy resins of standard resistor colors to let you determine ampere rating at a glance—even when the units are mounted near the top of a pole. Request Bulletin 503.



Type R Transformers

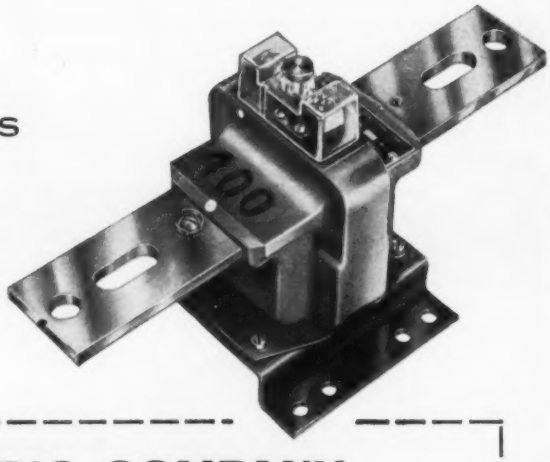
... for flexibility of application

Type R Transformers are light enough to be supported by the primary conductor alone, and are available in eight variations that give you unusual freedom in devising simple, cost-cutting installations for your system. See for yourself how these transformers can provide flexibility to meet growing needs. Request Bulletin 150 D.

New Type MV-6 Transformers

... for indoor installation

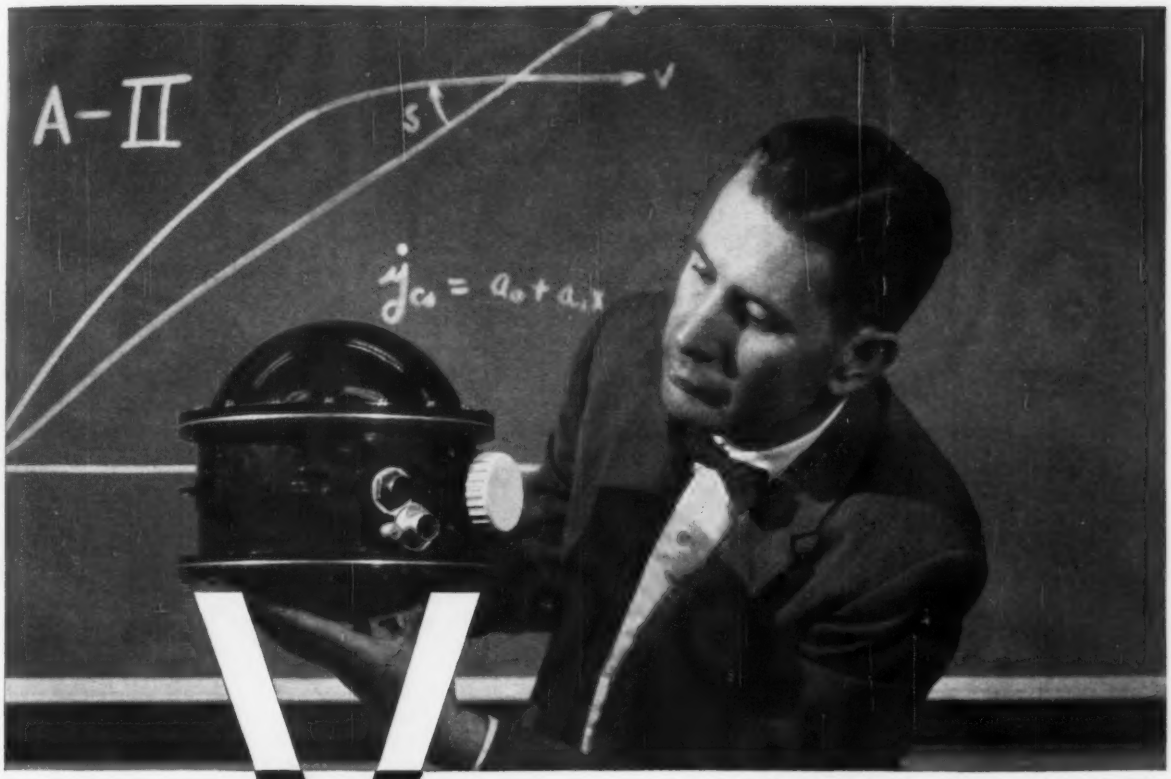
Here's a new wound-type current transformer that will reduce the cost of metering installations where more expensive weather-proof transformers are not required. The 400 ampere Type MV-6 meets the 0.3 A.S.A. Accuracy Classification for B-0.1 and B-0.2 burdens. Molded in epoxy resin. Bulletin 150D (1) gives full information.



SM59-6

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS



Edwin Felch, project director in charge of developing the Titan guidance system, holds the "voice" of the ICBM.

VOICE OF A GUIDED MISSILE

This is a missile-borne transmitter. It is the "voice" of a missile in flight . . . part of a new radio-inertial guidance system developed by Bell Telephone Laboratories for the Ballistic Missile Division of the Air Force.

This versatile system helped deliver the nose cone of a Thor-Able test missile precisely to its South Atlantic target area—5000 miles from Cape Canaveral, Florida. So accurately was the nose cone placed that a waiting group of ships and planes retrieved it in a matter of hours. It was the first nose cone ever to be recovered after so long a flight.

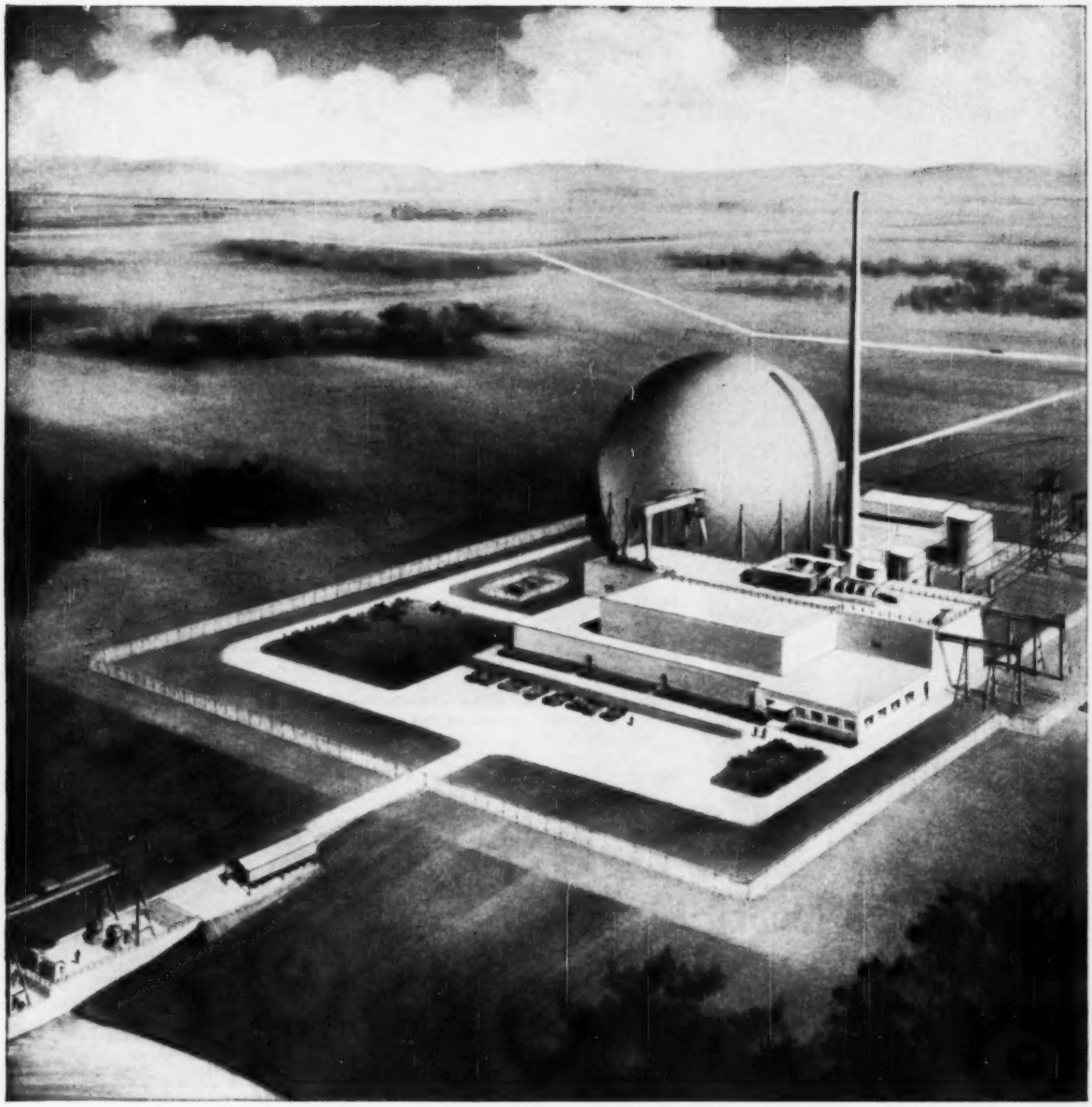
The command guidance system which made such accuracy possible combines precision tracking radar with a special Remington Rand Univac computer. Fed a steady stream of signals from the missile-borne transmitter, the ground-based equipment compares the missile's flight path with the preselected path. Corrective steering orders are computed and transmitted automatically to the missile. The ground station monitors the progress of the flight continuously and obtains immediate evaluation of mission success. And since the principal control equipment is kept on the ground, expendable hardware in the missile itself is minimized.

This radio-inertial guidance system is a product of the Bell Laboratories-Western Electric development-production team. It is in production at Western Electric for the first operational squadrons of the Titan intercontinental ballistic missile.

Bell Labs scientists and engineers developed the world's most versatile telephone network and much of our nation's radar. They have constantly pioneered in missile systems. From their storehouse of knowledge and experience comes this new achievement in missile guidance.

BELL TELEPHONE LABORATORIES

World center of communications research and development



Concept of a 306 MW boiling water nuclear power plant, the result of a design study for the U. S. Atomic Energy Commission, symbolizes Ebasco's competence in nuclear engineering and the company's 54-year reputation for outstanding quality in diversified engineering and construction work.

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GOOD NEWS in aluminum construction . . .

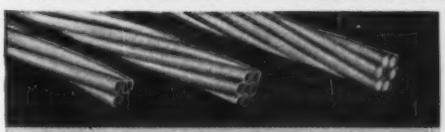
ALUMOWELD

Aluminum-Covered Steel Wire and Strand

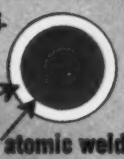
Alumoweld was developed to cut costs and improve performance of overhead ground wire, ACSR conductors, guy and messenger strand. Its thick aluminum covering —25% by area—gives Alumoweld corrosion resistance equal to solid aluminum wire and 33% of the electrical conductivity.

When used as overhead ground wire, remember that Alumoweld is just as strong as steel, is 18% lighter in weight, and has 3 times the conductivity. These advantages permit greater mid-span clearance, and make Alumoweld excellent for relaying and for discharging lightning currents to ground. For guys and messengers, Alumoweld Strand provides the full strength of steel and will last far longer.

These valuable properties also pay off when Alumoweld is used as core wire for ACSR conductors. Here, Alumoweld eliminates the hazard of dissimilar metals in contact, provides increased conductivity and gives you an extra-high-strength core wire that matches the life of the solid aluminum wires. For the complete story, send for Bulletin E.D. 3000.



Two Exclusive features of **ALUMOWELD**



Alumoweld's thick aluminum covering will never crack, flake or peel. Applied by an entirely new cladding process—the controlled atomic weld—the heavy aluminum covering and the high-strength steel core are inseparably interlocked by a ductile weld that remains permanent under all operating conditions.

COPPERWELD STEEL COMPANY

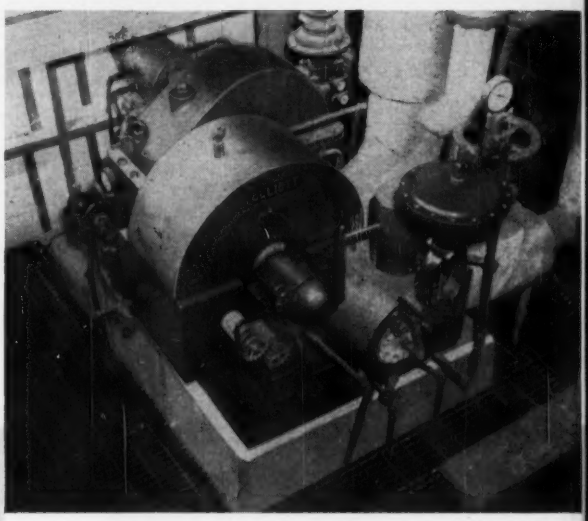
WIRE AND CABLE DIVISION, GLASSPORT, PA.

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

ELLIOTT TURBINES
since nineteen hundred four
MOTORS
since eighteen hundred eighty eight

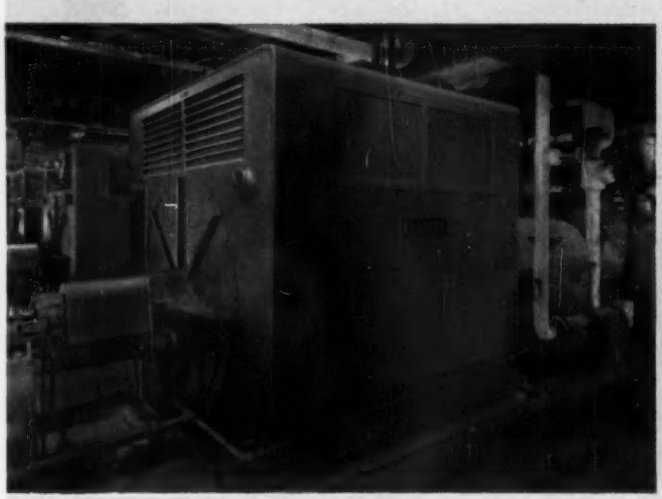
for your auxiliary drives...

Steam or Electric
Large or Small
Indoor or Outdoor

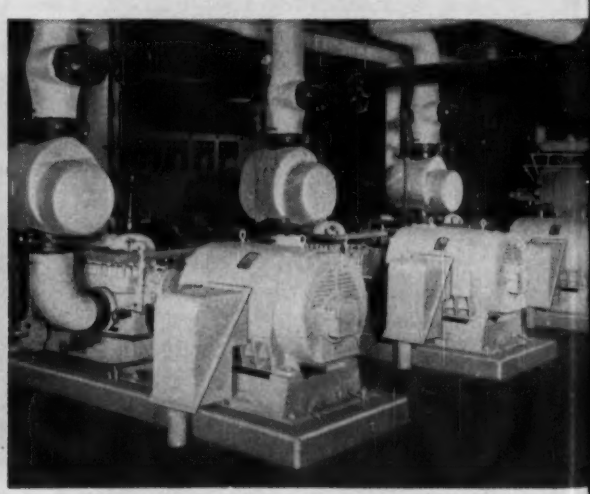


This Elliott geared turbine drives the induced-draft fan serving the 120,000-lb-per-hr boiler for a northeastern pulp mill. Elliott turbines are noted for simplicity, flexibility and year-in and year-out dependability.

ELLIOTT Company
JEANNETTE, PENNSYLVANIA

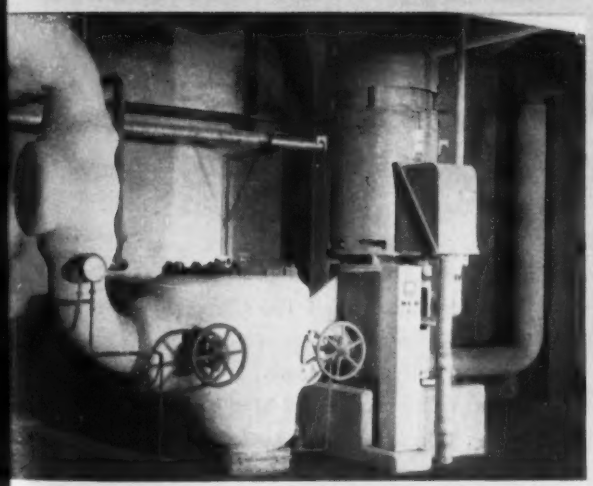


Biggest boiler-feed pump motors in the country—each rated 5000 hp at 3600 rpm. Quick-access openings visible on near end of motor; removable swing-down filter panels on each side. Elliott "Super-Quiet" enclosures. 6000-hp Elliott motors will soon be operating.

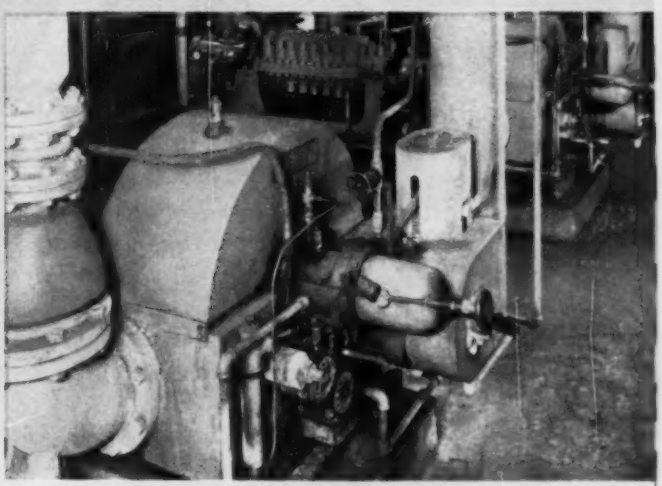


Heater drain pumps are driven by identical 200-hp, 3600-rpm Elliott motors. Elliott water strainers are mounted in pump inlets. Other Elliott products for power plants include condensers, ejectors, deaerating heaters, tube cleaners and expanders.

Dripproof 600-hp, 900-rpm Elliott motors driving line of coal pulverizers. Elliott FABRI-STEEL construction assures structural rigidity; FABRI-SEAL insulation assures maximum service life.



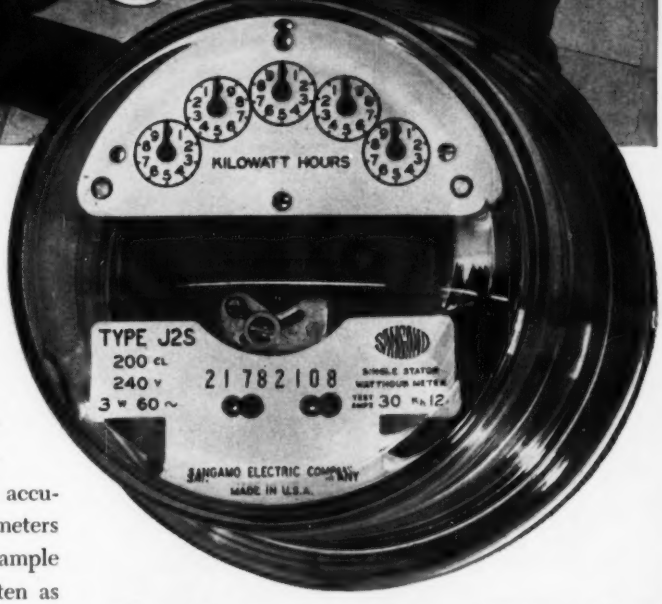
Here an Elliott 250-hp vertical, dripproof motor is shown driving a condensate pump. An Elliott twin basket water strainer which protects the pump can be seen at the left. Elliott C-W motor experience dates from 1888.



250-hp, 3550-rpm Elliott turbines drive boiler feeders in this industrial plant. All major auxiliaries in this station are Elliott turbine-driven. For over a half century, Elliott has been building turbines and turbine-generators.

Planning sample meter testing?

The success of your sample testing of tomorrow depends on the meters you buy today



Simplification of testing procedures can save your company up to 50% in meter testing costs. But the success of sample testing depends on the overall accuracy of the meters on your lines. 5 and 10 amp meters put a definite roadblock in the path of random sample testing by requiring tests up to ten times as often as modern meters. The meters you buy today can directly affect your sample testing of tomorrow.

Utility commissions are much more likely to approve the use of cost-saving testing methods if the meters on your system have sustained accuracy.

Sangamo J2 Meters provide such sustained accuracy with the highest torque and the slowest disk speed of any singlephase watthour meter. The Class 200 J2 Meter is adequate for *all* services . . . is accurate at 1½ amps . . . with ample capacity for the loads of the future. An analysis of the advantages of the J2 Meter is detailed in the "Meterman's Check List." Write for your copy today.

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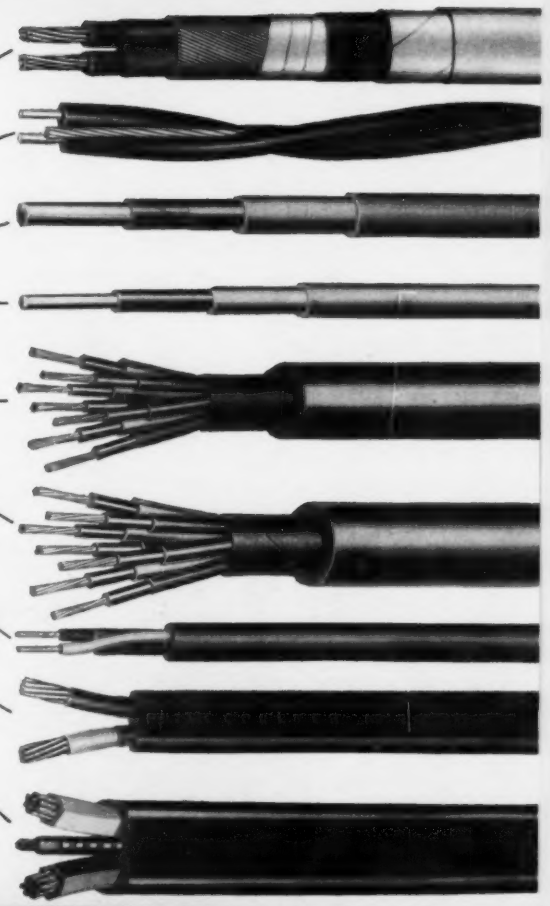
ANYWHERE...
ANY KIND...When the Call is for Cable, CALL FOR Collyer


Collyer SE Style U or A
Collyer Neutral Supported Service Cable
Collyer Type AVB
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Collyer C-141 (Polyethylene, Nylon, PVC)
Collyer RR Control Cable (Oil Base Insulation)
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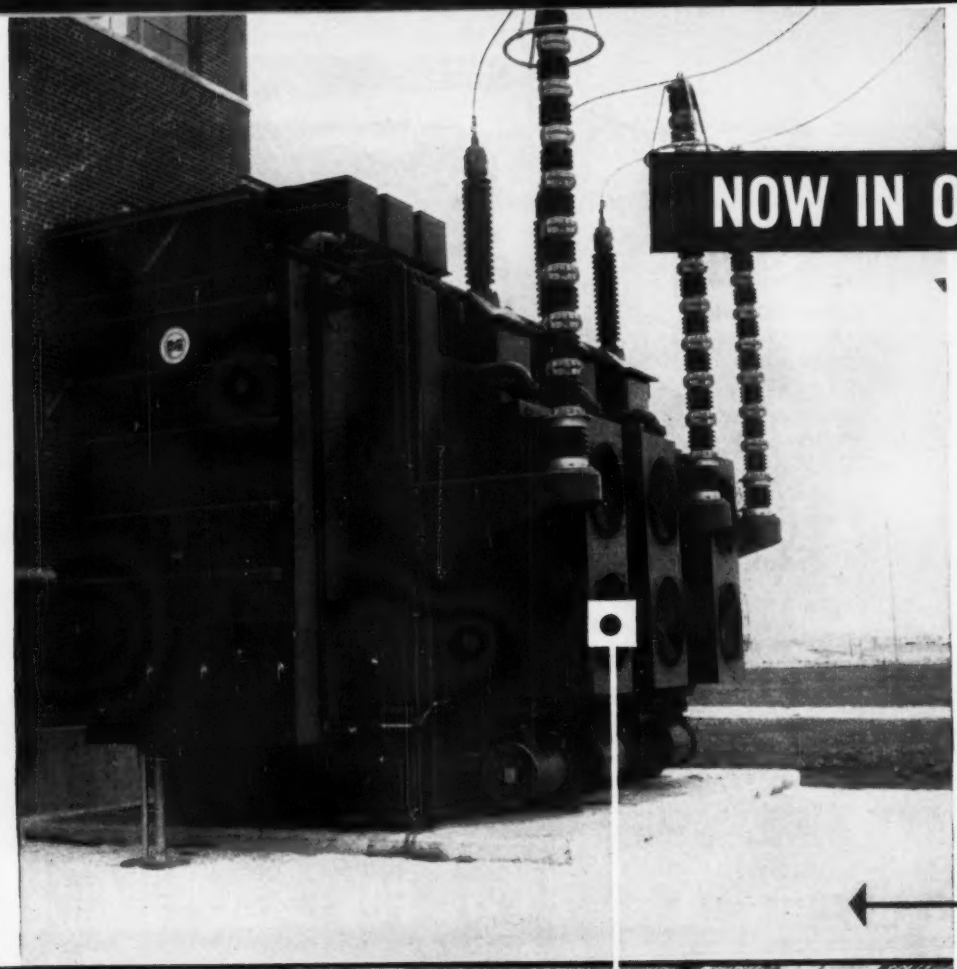


Equipped with a type MH LTC mechanism in which Moloney's rotary type load transfer switch serves as the sole current interrupter leaving the tap selector mechanism arc free.

The load transfer switch also by passes the reactor on full cycling positions thereby eliminating reactor loss and voltage drop.

Connected to the generator through isolated phase bus duct and equipped with forced oil-to-air heat exchangers, the unit makes a compact, unencumbered installation.

MOLONEY ELECTRIC

SALES

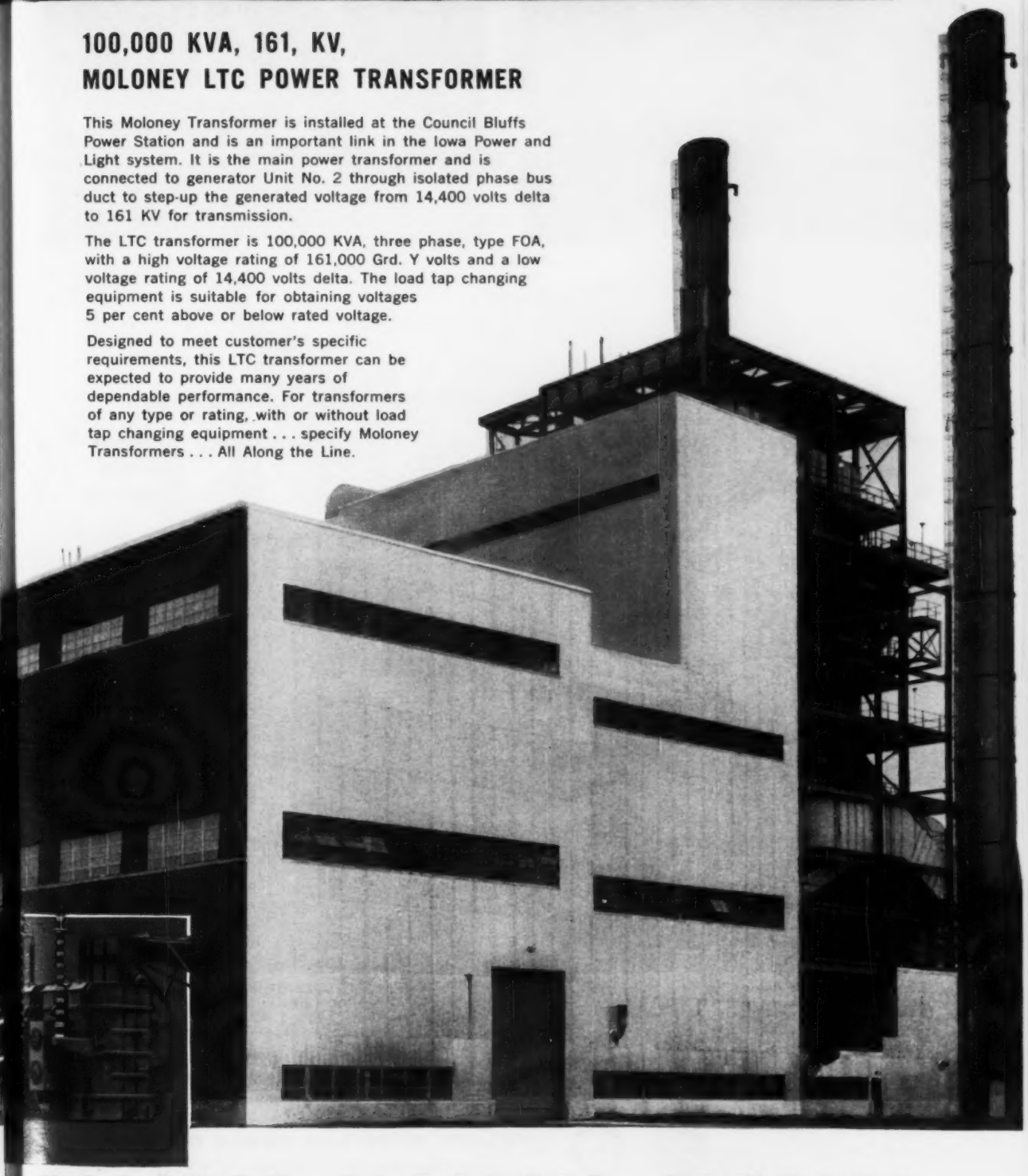
FOR IOWA POWER AND LIGHT COMPANY

100,000 KVA, 161, KV, MOLONEY LTC POWER TRANSFORMER

This Moloney Transformer is installed at the Council Bluffs Power Station and is an important link in the Iowa Power and Light system. It is the main power transformer and is connected to generator Unit No. 2 through isolated phase bus duct to step-up the generated voltage from 14,400 volts delta to 161 KV for transmission.

The LTC transformer is 100,000 KVA, three phase, type FOA, with a high voltage rating of 161,000 Grd. Y volts and a low voltage rating of 14,400 volts delta. The load tap changing equipment is suitable for obtaining voltages 5 per cent above or below rated voltage.

Designed to meet customer's specific requirements, this LTC transformer can be expected to provide many years of dependable performance. For transformers of any type or rating, with or without load tap changing equipment . . . specify Moloney Transformers . . . All Along the Line.



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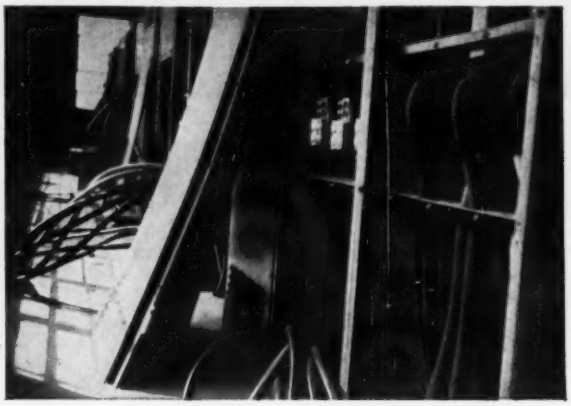
Installed in underground ducts, Paranite Super Pararite-Paraprene® network cable services a modern electronic computor installation.

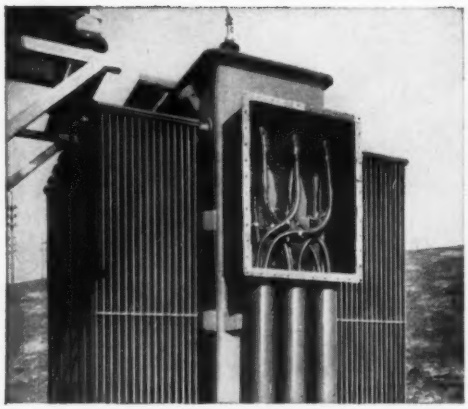
Paranite Super Pararite-Parasyn cables carry primary power between transformers and switchgear control panels in an ore reduction plant.



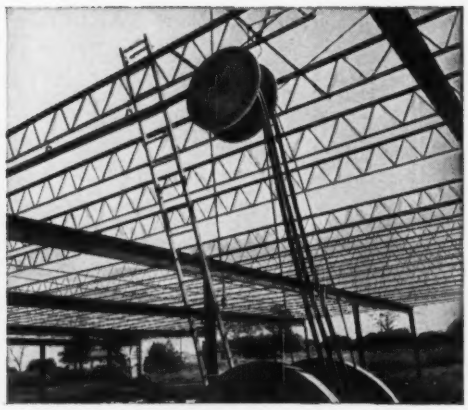
Across the nation for trouble-free installations...

PARANITE®

"IF IT'S PARANITE IT'S RIGHT"®



Paranite Super Pararite-Paraprene cable serves as the primary transformer feeder in a new municipal water pumping station.



Overhead duct installation of Paranite Super Pararite-Parasyn® (PVC) serves as a secondary feeder cable in a manufacturing plant.

The consistent selection and performance of Paranite cables from 600 volt network through 23,000 volt power cables mark them as products of close quality control. These Super Pararite-Paraprene and Super Pararite-Parasyn (PVC) cables illustrated above, indicate the versatility, national availability and proven trouble-free performance of Paranite installations.

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THE AUTOMATIC PLANT

. . . . . *technology is ready, but close scrutiny of economics is essential*

by W. W. Hopwood
President, Hagan Chemicals & Controls, Inc.

There is no question that most of the hardware for a computer-controlled power or process plant is available today—however, we feel that enthusiasm for this concept has led to a glossing over of the economics of the situation. In addition, as the art of computer control stands today, reliability requirements have been compromised.

We have taken these, and the many other factors which bear on the successful installation of computer control, into consideration in formulating our position, which is: Only as many steps towards complete computer control should be taken as can be justified both technically and economically. Since it is almost impossible to compute the dynamics of a process in advance of its operation, it is only logical to establish a sequence which will permit each step to be tested and justified before the next step is taken. Of course, if a specific situation requires it, the complete package can be installed at once. Here are the steps which we at Hagan feel are reasonable and economically sound:

1. Install a solid state electronic analog control system.
2. Install a solid state electronic scanning-logging data system.
3. Install computer capacity to compute from processed data.
4. Add programming capacity for automatic start-up and shut-down, as well as day by day operation.

Hagan equipment is designed to implement such a program. The Hagan PowrMag analog computer control system, featuring all solid state—magnetic amplifiers, requires minimum maintenance and provides a high degree of reliability and sensitivity with fast response. DC operation at the 1 to 9 volt level permits simple wiring, and the output is ideally suitable for use with the Kybernetes data processing-computing system.

We are ready, at this time, to take the computer control concept as far as the specific operation and management requirements determine.

Kybernetes put into operation at water works system in one day.

The Kybernetes system at an eastern water works *was installed and tested to be operational in one day.* Ninety-two inputs, representing flows, levels and pressures will be displayed as digital values on the main control console. In addition, two typewriters will print out the data for permanent records, and the system permits trend logging of selected variables without interfering with basic scanning. Alarm scanning of all incoming data is also performed automatically. If any variable exceeds preset minimum or maximum values, a visual and audible alarm alerts the operator to take corrective action. Installation test showed that the Kybernetes system was handling all available inputs.

Hagan PowrMag provides high reliability analog computer control

Utilizing magnetic amplifiers as the basic unit, the Hagan PowrMag system represents the most advanced electronic approach to industrial process control. Reliability and long, maintenance-free life are assured in every phase of the system, including inputs, analog computer-controllers, remote control stations and final control elements.

The PowrMag amplifier is a high gain, DC, magnetic amplifier composed of toroidal magnetic cores, windings and silicon diodes . . . all potted in epoxy resin and sealed

in a steel can—thus assuring reliability and long, tamper-proof life. Associated with the amplifier are remote control stations which provide the desired functions, and the whole unit may be mounted on panels up to ¼" thick, occupying only 2½" x 5¼". Utilizing a 1 to 9V DC input and output signal, the system is unaffected by stray AC, information is not deteriorated between measured variable and the final control element. Signals may also be fed to data processors or recorders without interfering with the control action.

PowrMag systems are currently being installed on (1) a 1,250,000 #/hr pulverized coal fired, divided furnace, controlled-circulation steam generation unit for a southern utility, (2) a 2,310,000 #/hr pulverized coal fired, single furnace, single drum, dry bottom reheat type steam generator for a midwest utility, and (3) a 1,700,000 #/hr 2400 psig, 1050°/1000° controlled circulation boiler at an eastern utility.

The Hagan PowrMag system is simple, yet extremely flexible in application. The basic elements are interchangeable, which limits stocking problems. Each element in the system is designed for long, trouble-free life, and adjustment of any loop is easy and exact. Here is the answer to the demand for a sensitive, accurate system with high stability and the utmost in reliability.

Kybernetes data processing system adds new flexibility

The new Kybernetes Series 2000 allows a new approach to the problem of scanning, logging, alarm scanning, computing, optimizing, programming and the many other uses to which data processing systems are put. Of modular construction and utilizing solid state components, the new Kybernetes features optimum reliability allied with such flexibility that a new dimension is added to data processing.

The basic system is a simple logging unit for recording process data on a log sheet or other output device. Because of its modular construction, this basic system can be expanded in both number of points handled and the complexity of the operations performed. This concept is in keeping with the Hagan approach to computer control, since any one or all of these functions may be added as it becomes desirable:

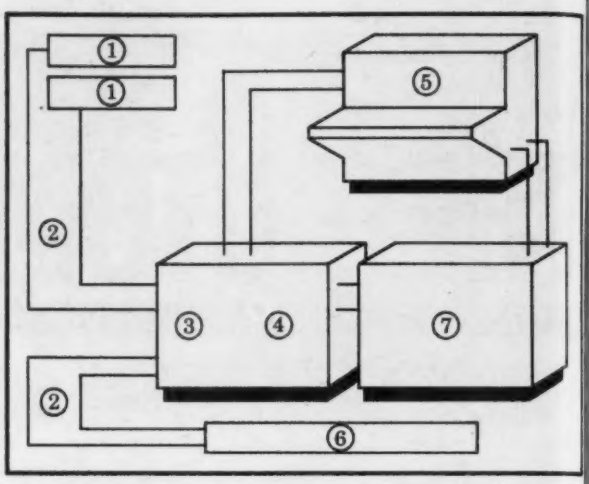
1. Alarm scanning.
2. Printed or visual trend logging of selected variables.
3. Computing or integrating.
4. Automatic programming and optimum setting of control.

With an accuracy of 0.1% on all inputs, the new Kybernetes reflects the simplified design logic which guided its design, and the reliability of all components is assured by the use of solid state devices.

In addition to numerous chemical, refinery and general process installations, a Kybernetes system will process data on the largest steam boiler in the world—a 3,850,000 #/hr unit now under construction at a southern utility.

Maximum usefulness with minimum investment characterizes this development. Field tested and proved, the new Kybernetes data processing unit will provide long, trouble-free operation.

The diagram illustrates a typical installation of Hagan PowrMag units in association with a Kybernetes data system for overall plant control.



1. Transducers convert measured variables into DC electrical signals and transmit to the central analog control computer via two-wire electrical cable. These signals may be recorded or indicated.

2. Two-wire, color coded cable, terminated with vibration-proof taper pin fittings, permits no-lag electric transmission of the measured process even in the largest plant. The system is designed so that the DC signal is, for all practical purposes, unaffected by stray AC potentials. The taper pin connections eliminate all field soldering or terminal box connections.

3. Signals enter plug-in patchboard section of analog computer. Patchboard is arranged to permit interconnection of system in any desired manner by simply moving taper pin connections.

4. PowrMag analog computer control elements are composed of operational magnetic amplifiers. They perform all the required control operations such as addition, subtraction, ratioing, integrating (reset), differentiating (rate), multiplication (proportional band), etc.

5. Remote control stations, located on the central control panel, provide process set point, bias, ratio, and other manually set control operations and have both output and null indicators.

6. Final control elements such as valve positioners, damper operators, saturable reactors, etc., receive the signal from the computer and act on the process function under control.

7. Series 2000 Kybernetes data processing system (see Bulletin MSP 161) can log, scan, trend log, read out, compute and integrate data as received from the PowrMag transducers, thermocouples, and other primary sensing elements. In addition, the Kybernetes digital computations can be used to return set point instructions to the PowrMag analog computer to optimize process controls.

For Bulletin MSP 161 (Kybernetes Data Processing Systems) and MSP 163 (PowrMag Electronic Control Systems), write to:

HAGAN CHEMICALS & CONTROLS, INC.

DIVISIONS: CALGON COMPANY, HALL LABORATORIES

HAGAN BUILDING, PITTSBURGH 30, PA.

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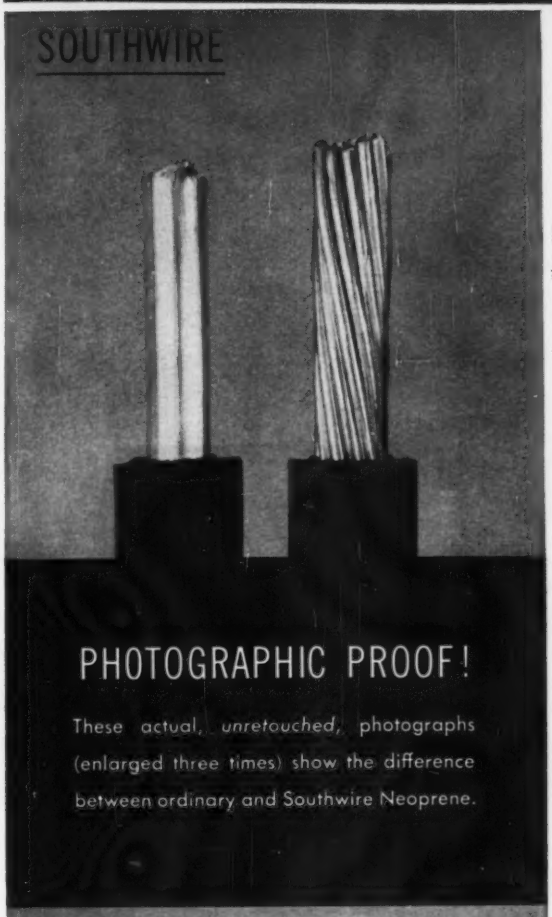
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These actual, *unretouched*, photographs (enlarged three times) show the difference between ordinary and Southwire Neoprene.
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SOUTHWIRE

NEOPRENE COVERED COPPER

Get what you pay for when you order free stripping Neoprene Covered Copper Wire and cable—not just some of the time, but every time!

Southwire's compounding and extruding techniques, developed only after long and exhaustive testing, are your guarantee of premium quality—and long, trouble-free conductor performance.

Southwire Neoprene is consistently 100% free stripping. It will not stick—even to stranded wire. It will not discolor the copper. Wires need no scraping before connections are made.

And there is no premium in price for this superior product—another Southwire first!

- **NO STICKING – NO DISCOLORATION**
- **NO SCRAPING NEEDED FOR CONNECTIONS**
- **NO PREMIUM IN PRICE**

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SOUTHWIRE serves the world

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SD Dead End Strain Clamp

New . . . Anderson Electric's aluminum SD Dead End Strain Clamp with two exclusive features: keeper pieces are captured to U-bolts for quicker installation . . . no need to cut cable for insertion . . . no need to remove clamp bolts, nuts or keepers. Exclusive nose extension permits more stable seating of clamp nose at cable entrance into hot line strain carriers. Makes for easier maintenance of strain insulator strings.

SD Clamps are available in a wide range of cable sizes—.20″ to 1.55″. They are sold **only** through approved insulator manufacturers.

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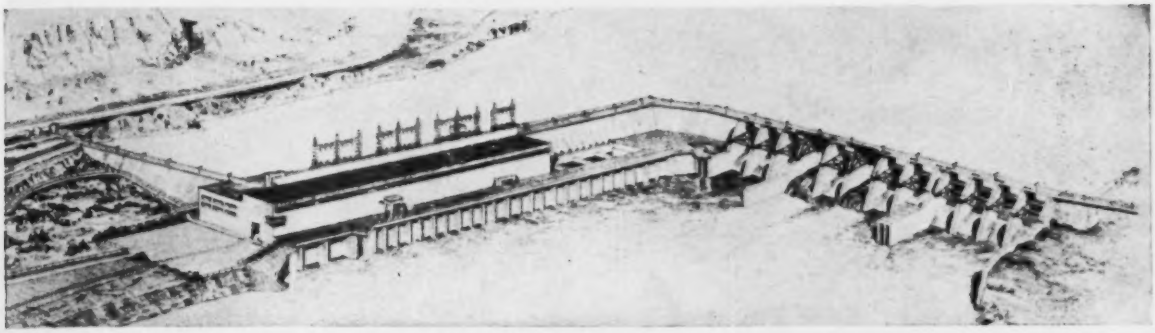
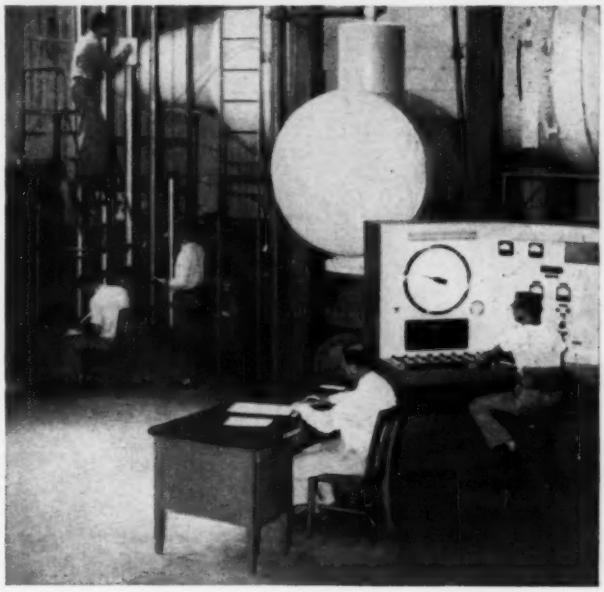


Rocky Reach Hydroelectric Project, under construction on the Columbia River by Public Utility District No. 1 of Chelan County, Washington. Stone & Webster Engineering Corp. are Engineers and Supervisors of Construction. The installation is downstream from Chief Joseph Power Project, where six 100,000 HP vertical Allis-Chalmers Francis units are installed.

Homologous models for Rocky Reach were tested in the York Works Hydraulic Laboratory under controlled conditions that duplicate those in protoype field installations.

ROCKY REACH TO USE ALLIS-CHALMERS KAPLAN TURBINES

High-capacity units to be equipped with special new Runaway Speed Limiter



Rocky Reach Hydroelectric Project, scheduled to generate electricity in 1961, will be powered by seven Allis-Chalmers Kaplan turbines. These 280-inch units are each rated at 140,000 HP under a 92-foot head, with maximum expected capacity exceeding 160,000 HP under a 98-foot head. This new high-capacity design, with greatly improved cavitation characteristics, was developed by Allis-Chalmers engineers at the York Works and tested in the high head test stand there.

Each unit will be equipped with a special new turbine Runaway Speed Limiter, which will make it impossible for a speed of more than 85% over normal to be attained. The possibility of excessive overspeeds of 150-200%, previously an accepted characteristic of Kaplan-type turbines, is positively eliminated. A substantial saving in the cost of generators resulted from this new method of speed limitation.

Its feasibility was proved by laboratory and field research. Field acceptance tests on installations equipped with the Runaway Speed Limiter have confirmed its complete dependability and effectiveness.

You can look to A-C for the latest design, engineering and manufacturing advances in hydraulic turbines and accessories. For information, write to Allis-Chalmers, Hydraulic Division, York, Penna.

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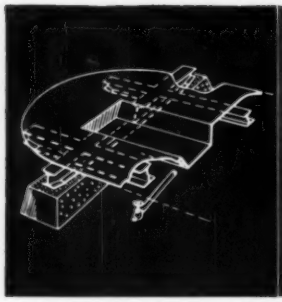
LIGHTER! LOWER!

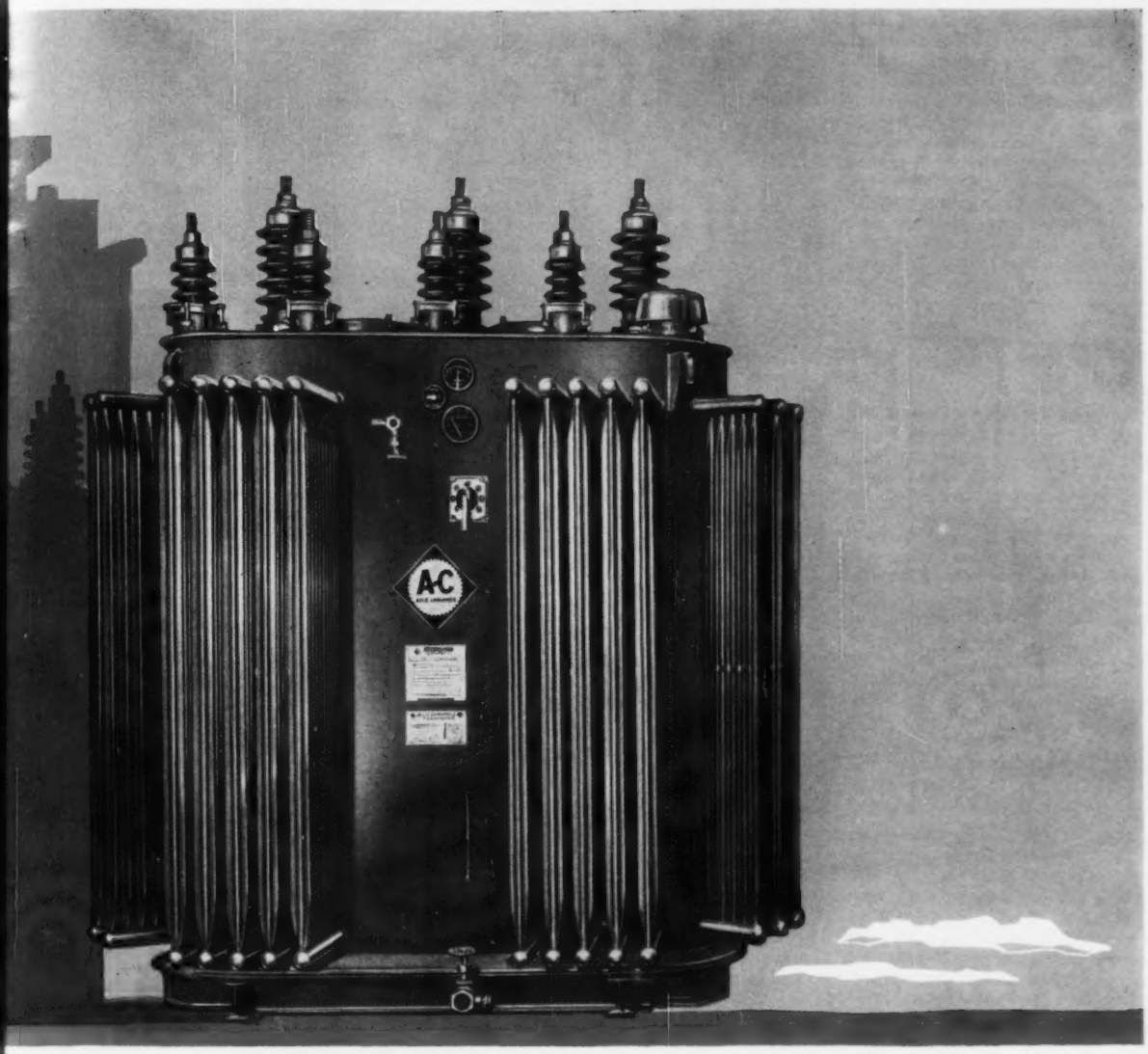


New base design permits mounting on smaller pads, low-cost piers or concrete planks.

Grouped instrument arrangement at convenient height for easier reading.

Self-resetting mechanical relief device automatically resets and reseals after operation.

Simplified hand-hole covers use only 5 captive "J" bolts instead of 14 loose nuts.



BY 30%!

- **Slashes installation costs**
- **"Hide-away" design** with lower profits
- **Instruments grouped** for operator convenience
- **Base designed** for pier or pad mounting
- **Cleaner appearance,** easier to maintain — no external bracing

ALL new—lower, lighter too!

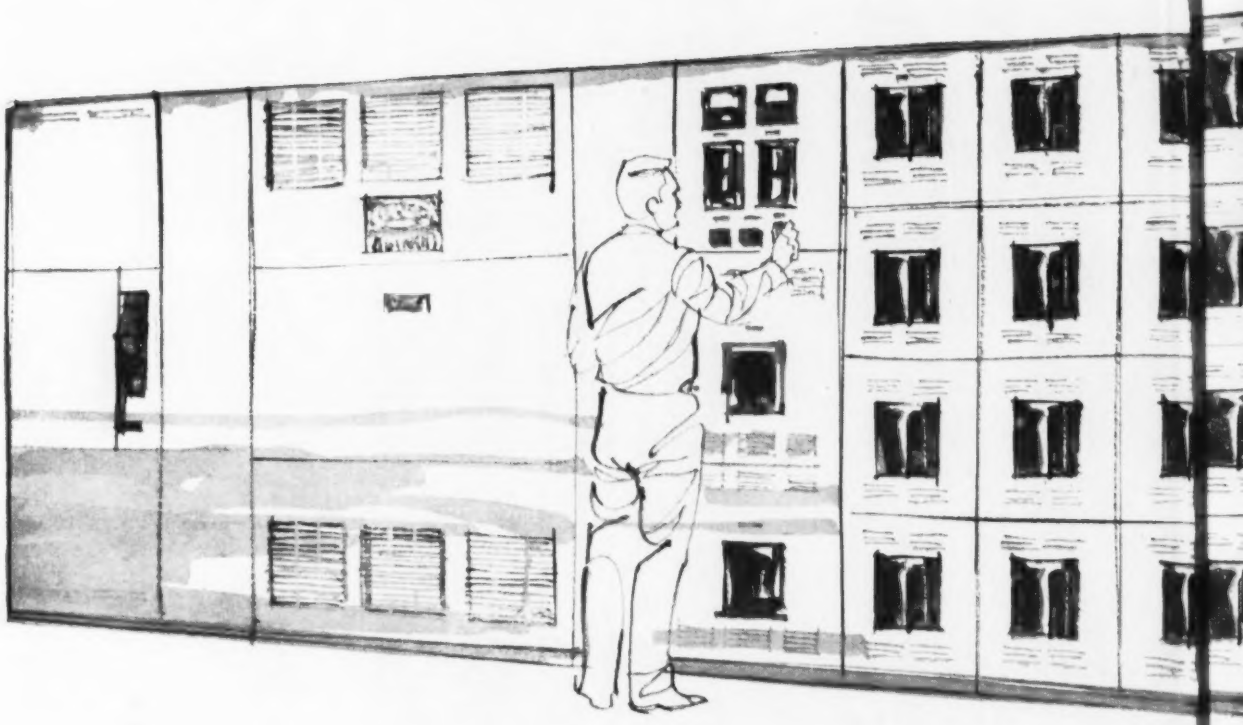
How's this for weight savings? The 34.5-kv, 3750-kva transformer, for example, is now 8000 lbs. *lighter* than its predecessor . . . brings big savings in handling and pad costs. Losses, exciting current and noise level are also reduced.

Easier servicing! Base sump collects any contaminant, removing it from active oil, permits sampling and draining at very bottom. Tap changer easily operated from ground level. Unit is reinforced from *inside* — smooth, clean appearance — no external bracing.

There's more savings to this A-C story. Get the details at your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-1178-E

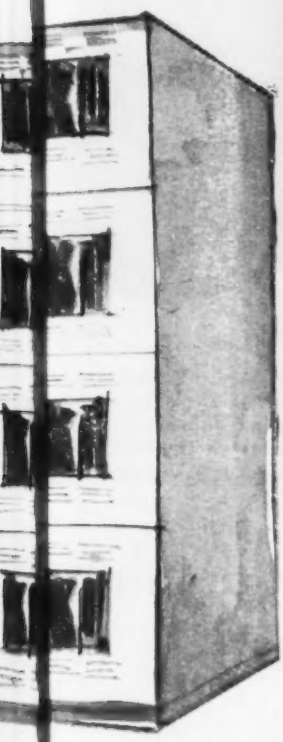


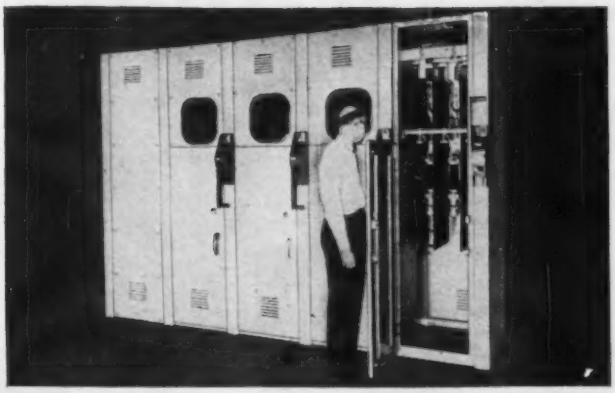
AHEAD

An I-T-E Secondary Unit Substation is more than just a source of power for your central station requirements. It's an investment that puts you years ahead in station equipment.

The new I-T-E K-LINE circuit breakers are unmatched for safety, protection and lasting economy. Manual quick-make, extended range trip adjustment, and closed-door disconnect are all combined in a single, compact design. The transformer is built by I-T-E for your own particular application on a basis of fresh engineering ideas original with I-T-E. The I-T-E primary fused interrupter switch or metal-clad circuit breaker closes even into a fault with complete safety for the operator, and the entire substation is assembled and shipped from a single plant . . . you are assured complete coordination, easy assembly, and on-time delivery.

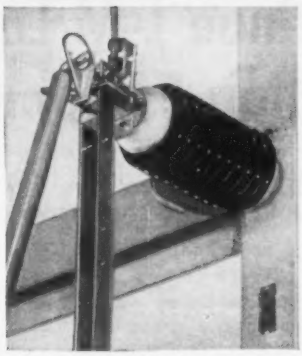
If you want to be ahead in the equipment you buy, look into the broad I-T-E line. Users claim you can't buy better, yet it costs no more.

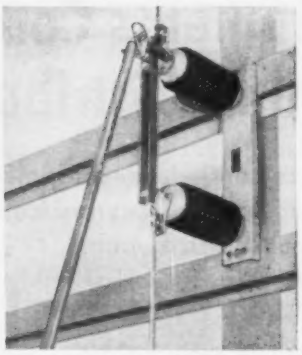




Safe switching. Yes, there's real economy in fused power switching centers, but make sure you also get the *extra safety* only I-T-E offers. In every I-T-E Power Switching Center, you have the assurance of knowing that switches can be closed *even into a fault* with complete safety for both personnel and equipment. Unique standardized cubicles and building block construction reduce engineering expense (the saving is passed on to you), and also shorten the time between order and delivery. Equipment arrives on the job in sturdy, preassembled units, ready for easy, fast installation.

Disconnect circuit breakers with door closed. I-T-E low-voltage metal-enclosed switchgear gives new operator safety. K-LINE circuit breakers can be moved from connected, through test, all the way to disconnected position without opening door. Overload setting easily adjusted to new load conditions by expanded calibration overcurrent trip device. Manual quick-make affords safer operation and extends contact life. Compact construction permits 4-high mounting of circuit breakers of up to 600 amp rating. K-LINE ratings: 600 v a-c, 250 v d-c, 15-1600 amp continuous.





Hear it snap shut. New I-T-E hook-operated disconnecting switches provide positive indication that they have closed completely. An easily audible "snap" is heard. And extra-large latch members serve as visual assurance. Parallel blades are widely spaced and heavily braced for maximum rigidity. Roomy hook-stick eye and pryout motion in opening contribute to the easy operation of the switch. Ratings: 7.5 through 69 kv, 600 and 1200 amp.

U-3

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1900 Hamilton St., Philadelphia 30, Pa.

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- ☐ K-LINE circuit breakers
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- ☐ Isolated phase bus
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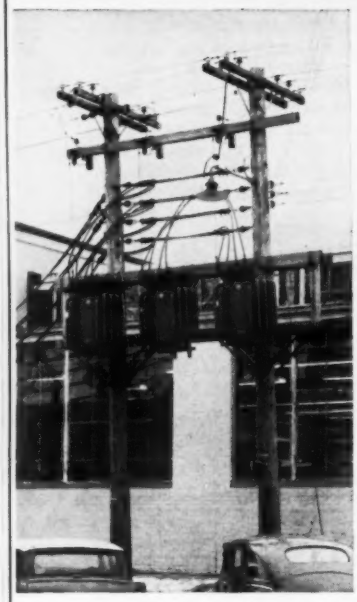

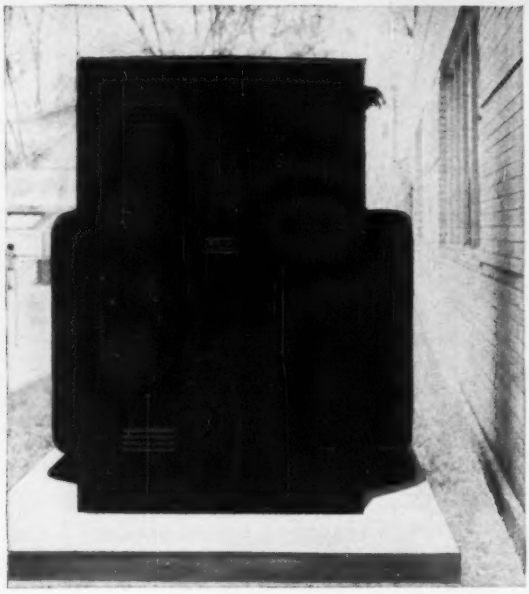

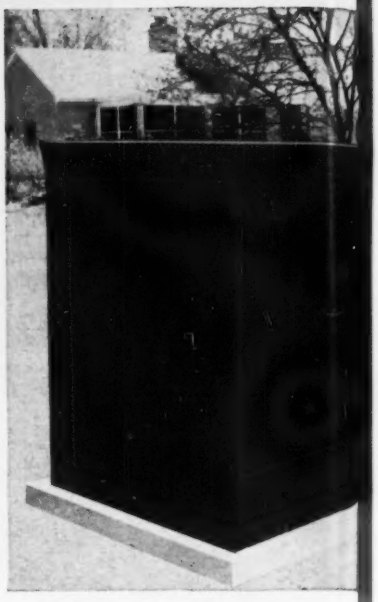

APPEARANCE is one important reason for going from overhead to underground construction. Today, the utilities working with Line Material have equipment available such as this L-M 12 kv, 300 kva, three-phase Pad-Mount transformer to replace the older-style pole-mounted bank.

ANOTHER SOLUTION to unsightly overhead banking is the Line Material Transclosure. Originally designed for either standard single or three-phase, pole-type distribution transformers, it can also be used singly or ganged to provide as much space as is needed for switching and protective devices.

New Developments Continue L-M Leadership in Underground Distribution Equipment

L-M Engineers continue development of new products to help utilities find the most practical, economical solutions to the growing pressures for underground distribution.

By **R. C. KIRK**, Vice President
Research and Engineering, Line Material Industries

As utility men know, there are growing pressures in many areas, to install distribution lines underground. These pressures come from the public, from subdividers and builders, and from communities.

New L-M Developments Help Cut Cost

Recognizing that these pressures are continually increasing, Line Material over three years ago, began working with utilities to produce equipment that would economically and practically solve this problem. The result is additional equipment from L-M which offers substantial reductions in underground distribution system costs, namely:

1 The Pad-Mount Transformer—a distribution transformer with a self-contained enclosure for terminals, switching and protective equipment that can be mounted on a ground-level pad or on a rooftop.

2 The Transclosure—a ventilated steel enclosure, also mounted on a ground-level pad, for pole-type distribution transformers, protective and switching equipment, load transfer equipment; can also accommodate service meters and telephone equipment.

3 The Power Pedestal—a stake-mounted pedestal for above-ground connection and termination of underground secondary services and secondary mains.

Underground Distribution Headquarters

Because of our extensive work in this field we logically consider Line Material as "Underground Distribution Headquarters." We would be happy to share our knowledge with you and would appreciate the opportunity of showing how our products can provide a practical and economical solution to your underground problems. Contact your L-M Field Engineer, or write me direct at Line Material Industries, Milwaukee 1, Wisconsin.

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LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
McGRAW EDISON

Underground Distribution Headquarters

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

We're Still Optimistic

On the occasion of last year's annual industry forecast we wrote an editorial titled "Why Not Be Optimistic?" We had just passed through one of the most disappointing periods in the electric utility industry's postwar history. In the editorial, we gave all our reasons for optimism in the face of this fact.

And while it might have seemed brash, with absolutely no load growth in 1958's first seven months, we predicted total energy sales would post a 1.8% gain by year end.

Well, we weren't quite optimistic enough. We, along with everyone else, underestimated the economy's recuperative power. As you know, the recorded gain in 1958 was 2.0%.

Now, on the occasion of our completely new forecast, we want to point out we are still optimistic and in fact more so than last year. For instance, a year ago we predicted 1959 sales would hit almost 622 billion kwhr. Now we're estimating a reasonable goal of almost 626 billion.

And this same optimism pervades our new forecast for more distant years. In 1965 and 1975 we're 0.4% and 1.8% respectively, more optimistic than last year.

In brief, what we preached last year still goes, only more so.

Actually, our new forecast differs from last year's more than the miserly changes in grand totals indicate. For instance, in the residential area the '59 prediction is not quite as optimistic as in previous years, down 2.4% from last year's estimate of 176.3 billion kwhr. And in 1965 and 1975 our new residential forecast is lower by 5.6% and 6.8%, respectively.

Our near-term re-evaluation is based mainly on the impact of the late recession, which was particularly hard on electric appliance sales. So our rate of increase in average residential use is somewhat lower than had been anticipated. But this is considered a temporary setback, since appliance sales already have started to bounce back to previous highs.

Our longer-range cutbacks result from something more basic. For while we still expect to be serving the same number of new customers by 1975 as we predicted last year, it now appears the number of new all-electric customers will not grow as previously anticipated. Even to reach the levels we now predict, it will take more aggressive salesmanship than the industry has shown to date.

On the other hand, we're more confident than ever that industrial energy sales will climb even faster than previously predicted, under the broader use of automated production facilities to cut costs. So our new industrial sales forecasts for 1965 and 1975 are up 4.5% and 9.6% respectively over what we predicted last year.

Incidentally, our new industrial forecast for 1959 is up 2.1% over last year's, and for 1960 is up another 2.8%.

The net effect of these and other changes puts our industrywide sales forecast slightly ahead of last year's, overall. So, a year later, we say again: "Why Not Be Optimistic?" and plan accordingly for this continuing load buildup.

'QUAKE LAKE' SPILLWAY work brought 35 pieces of equipment to scene for work on moving 500,000 cu yd so that water flow could pass over slide without washing it out. A 5-to-10-ft layer of broken rock served as spillway facing

Teamwork Tames Rockslide Threat

Army Engineers direct big earth-moving operation to cut spillway across top of 20-million-cu-yd pileup; race against time prevents flooding and possible damage to Hebgen Dam

In a dramatic fight against time, the Army Corps of Engineers has averted a two-pronged threat posed by a rockslide in the Madison River canyon. The slide, one result of last month's earthquake in the Northwest, had completely blocked the river only 7 mi downstream from Montana Power Co's Hebgen Dam.

The water rising behind the slide threatened to inundate the toe of Hebgen Dam. This "Quake Lake," as it was quickly named, also posed the danger of causing a crevasse in the slide that would send a flood wave downstream to Ennis, 48 mi away, and cause havoc to the fertile Madison Valley.

Bulldozers Carve Channel

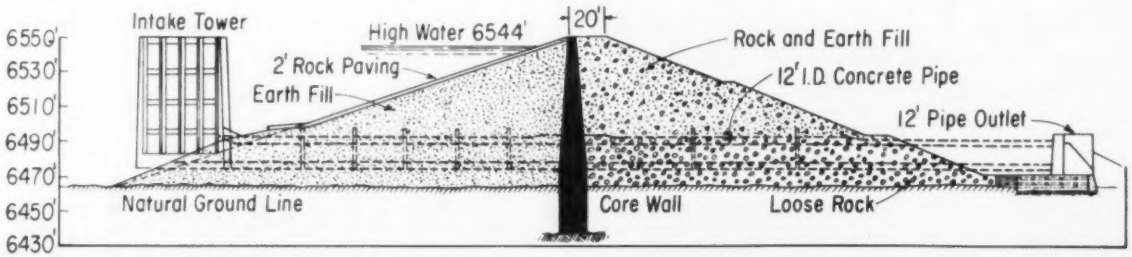
With the cooperation of contractors in Idaho and Montana, the engineers bull-dozed a road to the top of the slide and cut a channel across the top of the estimated 20-million cu yd of rubble. This spillway excavation is in the lower half of the slide area which measures from 200 ft high on one side of the gorge to 400 ft on the other. The slide is a mile wide at its base and 4,400 ft wide at the top.

The rockslide spillway was cut about 250 ft wide and from 12 to 25 ft deep. A flat crest section 900 ft in length across the top of the slide will hold the level of the new—and permanent—Quake Lake 10 ft below the toe of Hebgen Dam. Thereafter the spillway dips at a 5% slope for 600 ft and a 10% slope for an additional 2,000 ft.

A 5-to-10-ft layer of broken rock was dozed onto the spillway to prevent erosion as 3-ft flow of water gushed out of Quake Lake.

A relatively flat gradient and the spillway's ample width enable a capacity of 10,000 cfs without erosion. The major flow in the past 50 years was 6,000 cfs.

Meanwhile Hebgen Lake has been drawn down, both as a safety measure and to better assess the



RUGGED HEBGEN DAM, 44-year-old storage facility, withstood Aug. 17 quake with little damage. Drawdown is at 3,000-cfs rate through 12-ft dia control tunnel. Despite heavy flow over spillway, downstream slope resisted erosion

extent of damage from the earthquake. Water stood at 300,000 acre-ft—90% of capacity—when the quake hit.

Because the spillway was made inoperable, the drawdown is through the 12-ft-dia wood stave line control tunnel at a rate of about 3,000 cfs.

Montana Power Co engineers say the complete story on damage may not be known for two or three months. Preliminary investigation indicates the need for repair of the core wall, including grouting, and the spillway, both of which were cracked. Earth fill must be restored. Sonic devices are currently being considered for use to discover the extent and location of cracks in the core. Later test holes probably will be drilled down through the dam.

Damage reports filed to date say Hebgen suffered cracks on the crest of the dam near the spillway, the core wall had four vertical cracks where the wall joined the spillway structure, and portions of the dam embankment settled a maximum of 4 ft.

Flood Not Likely

Threat of a flood is not serious unless another major quake occurs, an official of MPC said. Precautions are being taken, nonetheless, for the safety of everyone in the area. MPC has set up an FM radio communications unit at the dam to form part of a warning network made of U. S. Forest Service and Civil Defense units and a Montana Highway Patrol mobile unit on the road below the slide.

Lt Col Walter Hogrefe, Garrison District engineer from Riverdale, N. D., said earth-moving equipment that was rushed to the slide area got police escorts in some cases. Some 35 pieces of equipment were sent to the scene. First job was to clear a 1,300-ft long road from the lower side of the slide to its top. This is the road over which the heavy equipment reaches the crest of the mountainous rock slide. Naranche and Konda Construction of Butte were the first to bring equipment into the area on Aug. 17.

The storage dam held up so well that designers and earthquake experts from all parts of the U. S. are studying effects of the jolt to benefit future designs.

Hydro Outlook: Mostly Gloomy

Water conditions generally good in Pacific Northwest, but subnormal rainfall may hurt East, Southwest, Dakotas

Water conditions are good in the Columbia River system, but the supply situation in some other sections of the West and Southwest are not so favorable, according to reports from government agencies and some private company systems. Conditions in the Tennessee River Valley have caused below-normal runoff while hydro output is off for Georgia Power and Alabama Power.

Bonneville Power Administration reports that all Columbia system reservoirs are full or have surcharge storage. Present flows in the Columbia Basin are above median and the outlook for hydro is at least median for the water season.

Odds are better than 50-50, say BPA hydrologists, that the agency can carry all loads with hydro during the 1959-60 drawdown period.

Pacific Power & Light Co also reports its reservoirs filled ahead of schedule last spring and "ample hydro capacity."

The U. S. Bureau of Reclamation, on the basis of Aug. 1 figures, tabulated the following supply conditions for the seven regions of the West:

Region 1—Fair to very good: This area covers the Pacific Northwest where "irrigation demands have been heavy but no serious shortage on any of the bureau projects is expected." Normal holdover storage is expected everywhere except on the Oregon projects where it likely will be exhausted by the end of the season.

Region 2—Releases have been greatest at Shasta Reservoir since operation began in 1929. Demands for USBR projects are being met without difficulty, however.

Region 3—Poor to fair: Precipitation during July was 38% of the 36-year average on the Upper Colorado River watershed, which includes southern California and Arizona; seasonal precipitation through July is 74% of average. Provisional runoff of the Colorado River near Grand Canyon was 57% of average while storage in Salt River Project reservoirs dropped 100,500 acre-ft, or a total of 334,100 acre-ft less than a year ago.

Region 4—Fair to good: The USBR breakdown is Western Colorado Projects, fair; Southwestern Wyoming Projects, poor; Utah projects, generally fair to good; Nevada Projects, fair to good due to holdover storage. Monthly precipitation over Region 4 was generally below 50% of normal.

Region 5—Poor: Adequate irrigation supply is available on all projects except the Middle Rio Grande Project and the Conejos Div of the San Luis Valley Project. In July, reservoir storage was reduced and only a small amount was available in Platoro and El Vado reservoirs. The region covers most of Texas, Oklahoma and New Mexico.

Region 6—Poor: The Dakotas and the eastern portion of Montana had an extremely dry July which upped demands for irrigation. Development farms using unregulated streamflow of the Cheyenne and

Seeding Successful

A three-year experiment in cloud seeding has increased rainfall by from 15 to 28% above rainfall expected in Santa Clara County in California. This is an increase equivalent to 11.65 in. over the whole target area, said Dr Arnett S. Dennis, vp of Weather Modification Co. He described the program at Denver in a meeting sponsored by the Irrigation and Drainage Div of American Society of Civil Engineers and American Meteorological Society.

James Rivers are threatened with shortages.

Region 7—Fair to excellent: Precipitation on the plains of Colorado, Kansas and Nebraska was about 50% of normal but the Upper Colorado area and the mountainous area of the Colorado-Big Thompson received about 80 to 100% of normal total.

Montana Power Co is now selling surplus energy to surrounding areas as its reservoirs on both the Columbia and Missouri river drainages are filled to capacity. The U. S. Weather Bureau at Helena, Mont., reported that average precipitation for June, 1959 was 2.53 in., compared with a normal of 2.91 in. July's average was .49 in. vs a normal of 1.40, making this July one of the driest on record. August figures were not available but total rain in Butte was 1.43 in., or .31 in. above the normal average.

In the Spokane, Wash., area, precipitation was 12.7 in., or 48% above normal, from January to August. Around Wallace, Idaho, January through August precipitation totalled 22.7 in., or 14.5% above normal. Washington Water Power Co noted that streamflow was above normal this year.

July rainfall in the Tennessee Valley averaged 4.64 in., slightly below the 65-year average, according to TVA. The area east of Chattanooga was nearly ¾ in. below normal, while the area west was slightly above. Runoff continued below normal, with the decrease ranging from about 1 to 5 in. below long-range averages at system dams.

Rationing in Norway

Lack of rain during July and August has occasioned power rationing for municipally owned and operated hydro plants in east Norway. The Industry Ministry ordered municipalities financing their power plant construction through domestic loans to make available 50% of their output to the regional grid. For those cities who raised their capital on the foreign loan market, no rationing has been instituted yet.

The U. S. Geological Survey says that in August, as in July, there was a rainfall-runoff deficiency belt parallel to the Appalachians and extending slightly west of the mountains. Storage, however, for reservoirs didn't look too bad at the end of last month.

Maine had a seasonal storage decline in August. Three major river systems and one minor system in Maine held greater storage than average on Aug. 31, but less than a year ago.

New England exclusive of Maine, declined during August to storages ranging from 77 to 103% of average. New York and New Jersey reservoirs were below capacity.

Three North Carolina power reservoirs in the Piedmont region had a net loss of 213-million cu ft in August and stood at 94% of capacity at month-end, but that's about 7% more than they held a year ago.

Coosa River flow is 51% of average for July and 55-60% for August. Precipitation in Alabama is about 15% below normal. Georgia Power says precipitation is down 10% and hydro output is some 20% below normal.

Unusual Transformer Fault Puzzles Supplier

English Electric says unit's winding and core suffered 'considerable burning.' The 330-Mva transformer went into service last April at TVA's Gallatin Steam Plant

Exact cause of the internal fault that resulted in failure of one of two 330-Mva, 22.5-161-kv, three-phase main generator transformers at Gallatin station of the Tennessee Valley Authority, on Aug. 29, remains undetermined, officials of the English Electric Trading & Export Co said last week.

The fault, which occurred on the low-voltage end of one leg of the transformer winding, resulted in heavy fault currents and "considerable burning," the manufacturer's engineers said.

Failed During Re-start

Failure of the transformer took place at a time when the generator with which it was associated was being brought up to voltage preparatory to returning it to service after being off the line for a few days, for normal maintenance. Full rated voltage level had not been reached, but was about 20 kv on the low-voltage side of the transformer when a differential relay and ground-fault relay operated.

Operation of these relays was accompanied by operation of the transformer sudden gas pressure relay as well. The transformer was not connected to the high-voltage bus at the time.

The 330-Mva power transformer, which was associated with generator unit No 3 at Gallatin, had been in service since April 21. The failure occurred within the guarantee period. English Electric Co has therefore assumed responsibility and will return the unit to England for repair, it was disclosed. The date when the unit will be shipped and how soon it will be repaired and returned to the Gallatin site is not known at this time, the manufacturer said.

Co-incidence Helps TVA

While the Gallatin transformer is being repaired a unit of similar but not identical rating will be diverted from TVA's Widow's Creek Station for use as a substitute. By coincidence, a General Electric Co transformer destined for the Widow's Creek station site was enroute to TVA when the accident occurred. It has been re-routed to Gallatin station and will be put into service there in the near future, according to an agency spokesman. The GE transformer used to replace the faulted unit has a 315-Mva rating.

Shift Begins on Radiation Hazard Control

The new Federal Radiation Council will report direct to the President, eventually assume most of AEC's radiation control; Principle of state control inherent in new bill

Policy decisions on radiation and how much the public can safely be exposed to have been raised to the highest political level—the White House—by creation of a Federal Radiation Council responsible only to the President.

At the same time, legislation was under way on Capitol Hill to turn over to the states as much responsibility as feasible for the regulation and control of radioactive materials used in commerce and industry.

Both moves could have important bearing on development of nuclear power.

The bill to return some control to the states will not affect the power industry in the immediate future, since state authority will not include nuclear reactors. Utilities have not asked for state control at this stage of development. But some observers feel that it establishes a principle of state control that may eventually extend to power installations as well as isotopes and X-rays. The bill passed by the Joint Committee on Atomic Energy may be called up for a vote before the end of this session.

AEC Criticism Leads to FRC

The Federal Radiation Council, however, will have a direct effect on all users of radioactive devices and materials. The council will gradually take over much of the authority on radiation control now vested in the Atomic Energy Commission. The Executive order establishing the council was an outgrowth of Congressional criticism earlier this year that AEC, interested chiefly in developing atomic energy, was not adequately concerned with protecting the public.

The council will consist of the secretaries of Health-Education-Welfare, Defense and Commerce and the AEC chairman, with HEW Secretary Arthur S. Flemming acting as chairman.

Flemming's appointment shows the President's intention that public health considerations should dominate the council's decisions. There has been considerable controversy over how much radiation the human body can absorb without harmful effects, and Public Health Service funds will be quadrupled to provide more research on this question. The National Council on Radiation Protection, an independent scientific group whose recommendations have been accepted as official guides, will still be consulted but the council will now have available its own sources of information to draw upon.

The new setup, though still somewhat undefined, apparently means that AEC will continue its present licensing and regulatory functions within a broad framework of policy laid down by the council.

Politics Charged

Even before the four-man council met to lay out its program, it came under attack from Sen Hubert Humphrey (D-Minn.) for its strictly political character. The joint committee's bill returning some control to the states also contains a section that would expand the council to nine members with scientists balancing out the politicians.

Duke Power Buys Nantahala System

Duke Power Co last week took first steps toward purchase of distribution facilities of Nantahala Power & Light Co in six western North Carolina counties.

Duke Power Pres W. B. McGuire announced that the 15,000-customer system is being bought for $4 million.

Nantahala, owned by Aluminum Co of America, is selling facilities in and around the towns of Sylva, Webster, Bryson City, Dillsboro, Franklin, Highlands, Robbinsville, and Andrews. The six counties involved are Swain, Clay, Graham, Cherokee, Macon, and Jackson.

Duke Power rates will become effective where they are lower than former Nantahala rates. Where Nantahala rates are lower, however, the lower rates will be continued for the present.

Not included in the Duke Power purchase are the larger Alcoa generating plants at Thorpe, Nantahala, Queens Creek, Tuckaseegee, Cedar Cliff, Bear Creek, and Tennessee. However, smaller hydro facilities at Mission, Franklin, Bryson, and Dillsboro, are included in the sale.

McGuire says Nantahala's residential customers average 4,134 kwhr annually—well above national average, but below Duke's system average of 4,848 kwhr per residential customer.

About 90 employees of the purchased Nantahala's operating department will become employees of Duke Power. But management of the system will be absorbed elsewhere within Alcoa.

The Duke purchase is subject to approval of the state utilities commission, and the Federal Power Commission.

Correction

In the story on Cornell Cable Tests (EW, Sept. 7, 1959, p 46), the names of Lapp Insulator Co, R&IE Equipment Division of I-T-E Circuit Breaker Co, and The Ohio Brass Co were inadvertently left off the list of participating manufacturers.

Lapp is supplying 345-, 69-, and 35-kv post-type insulators; R&IE is supplying 345-kv disconnect switch; Ohio Brass is supplying 345-, 69-, and 35-kv insulators and 345-kv terminal.

Insulation and Oil Tests Uncover Troubles

R. J. McGONEGLE, Tullahoma, Tenn.

A combination of insulation and oil tests on large oil circuit breakers can help uncover operating defects. An unusual group of test results were obtained by tests on a 161-kv, 10,000-Mva OCB.

Some maintenance criteria confirmed by the tests are:

1. Dc tests will show oil contaminants that can be polarized, such as lint; "as-tests" may not.
2. External insulation tests may not show a hazardous lift rod in a high-voltage OCB, or foreign material in the oil.
3. Oil breakdown tests and visual inspection are the most reliable indications of oil condition.
4. Contamination on the lower external porcelain surface of the bushing will affect the Ungrounded Specimen Tests (UST).
5. A filter press will not effectively remove free water from a tank by circulation of oil alone.
6. Internal inspection of tanks should be considered if insulation or oil tests prove abnormal.

Dc tests on the bushings of the 161-kv breaker at 2.5 and 40 kv showed that the C-phase tank had 150 times as much conductivity to ground as the other tanks. Sixty-cycle ac tests showed a power factor increase of 300 to 400% between the C-phase tank and the others. This was indicated by (1) ac potential applied from bushing conductor to ground and, (2) ac potential applied between bushing conductor and bushing capacitor tap (UST). Oil samples from C-phase tank were normal, but the voltage breakdown showed a drop to 25 kv from a normal of 35 kv.

External insulation tests on the C-phase tank became almost normal after only 4 hr of filtering the oil with a 1,200 gph filter press. A Doble Engineering Co water-in-oil meter in the filter circuit indicated the water content of oil drawn from the tank bottom, as well as filtered oil returned to the top of the tank. Oil pumped from the bottom of the tank was "supersaturated" with water during the first 6 hr of filtering, even though external insulation tests were normal after 4 hr.

The water content of the oil drawn from the tank was reduced to 30% saturation after 10 hr of filtering. It was then accidentally

Mirrors Add to Safe, Efficient Operation

Large side-view mirrors on heavy-duty vehicles can give drivers the "rear view" necessary for efficient and safe operation. This solution was tried after truck drivers of City Public Service Board of San Antonio, Texas, reported that small rear-view mirrors provided only limited visibility for driving and operating equipment.

Large side-view mirrors are installed on each side of all heavy-duty trucks. Long, rugged brackets were designed to support the mirrors and hold them in a position to give individual drivers the best rear view. The heavy-duty brackets also were made to withstand the rough service conditions encountered on large trucks.

Both truck drivers and crews report that trucks and equipment equipped with the large mirrors now can be handled more easily and with greater safety. As a result, crews are able to work more efficiently. This is reported by Richard Smith, construction engineer for the City Public Service Board.

s In Large OCBs

found that a breaker operation would release visible free water. A tank inspection was started.

A brown, syrupy substance was found on the walls of the lower half of the tank. A thick deposit was found on the ledge of the manhole entrance after the oil had been drained. Quantities of water also were on the ledge.

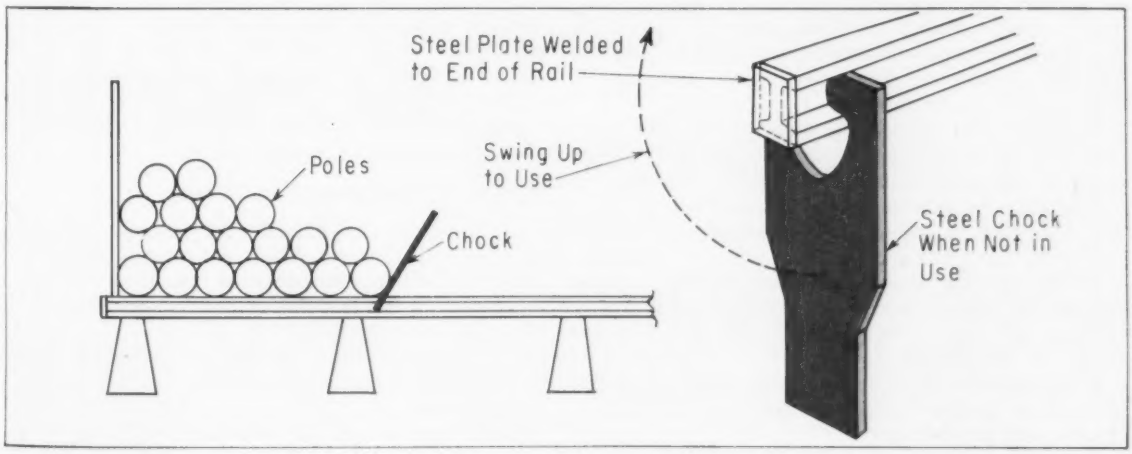
Water may have entered through a defective gasket which was found on the lift rod mechanism cover. The brown substance may have been left in the tank during construction.

The tank was washed with hot oil from heat-vacuum dehydrating equipment (Purivac). Lift-rod tests indicated the presence of moisture in the top lift rod section. After repairs, the tank was re-filled with dehydrated oil.

Summary of Test Results

	OCB Open						OCB Closed		
	C Phase		B Phase		A Phase				
Bushing	1	2	3	4	5	6	1–2	3–4	5–6
Test of Insulation									
Power factor, %...	3.0	3.0	1.1	1.1	1.2	1.0	2.8	0.6	0.6
Watts.....	0.45	0.45	0.16	0.17	0.17	0.15	0.80	0.16	0.16
Tank Loss Index.....	....	....	....	....	....	....	−0.10	−0.17	−0.16
Bushing Insulation (UST method)									
Power factor, %...	1.4	1.1	0.26	0.36	0.27	0.38			
Milliamps.....	0.73	0.73	0.74	0.77	0.74	0.76			
Watts.....	0.10	0.08	0.02	0.03	0.02	0.03			
Bushing Capacitance, Tap Insulation									
Power factor, %...	1.1	1.1	0.93	0.88	0.95	1.1			
Megohms.....	50,000→								
Megohms at 2.5 kv dc	1150	740	50,000→				435	50,000→	
Dc Microamps at 40 kv	....	....	....	....	....	....	130	0.8	0.8
Condition of Oil Samples									
Power factor, %...							0.06	0.06	0.07
IFT Number.....							35.6	34.6	35.6
Neut. Number.....							0.02	0.02	0.02
Color.....							1	1	1
Visible water.....							None	None	None
Kv breakdown.....							25	38	39

Movable Chocks Hold Line Poles Safely



Sliding steel chocks help Lowell (Mass.) Electric Light Corp handle and store line poles safely on a storage rack of steel rails mounted on concrete posts. Chocks hold against the rails to prevent pole movement but may be moved easily along the rails and down over the end for handling of poles. A plate welded to each rail prevents loss of the chock during pole handling.

Training Operators in Advance Pays Off At Tampa Electric's Gannon Steam Station

H. A. MOSHELL, Jr., Asst Superintendent of Production
B. D. KITCHING, Mechanical Engineer, Tampa Electric Co, Tampa, Fla.

A thorough and extensive program for training personnel to operate a new coal-burning station proved beneficial for Tampa Electric Co. Although the program's effectiveness is difficult to evaluate in terms of dollars, the company believes the money spent was justified. Personnel have shown an excellent knowledge of the station and kept it on the line during trying circumstances. The unit has not been tripped through an operator's error.

Basic elements in the program are:

1. Complete training manual and aids were prepared by the production staff.

2. Hiring of personnel was planned to conform with the policy of promotion from within and to have the added men when needed.

3. All personnel received advance training in existing stations. Senior employees were advanced to higher classifications for definite periods and then returned to regular assignments.

4. Classes for head watch engineers were conducted at Gannon Station during construction and tied in closely with plant tours.

5. Head watch engineers then taught the operating personnel, covering the manual twice in conjunction with tours.

6. Operating crews were formed 6 weeks before starting to operate equipment.

Tampa Electric felt that this extensive program was necessary because the unit differed from others on the system. Major items that are "firsts" for the company include: Central control room, reheat machine, coal-fired boiler, and electrostatic precipitator. Also, a deaerating heater was omitted from the feedwater cycle.

First step in the program was preparation of the manual and training aids. Manufacturers furnished advance copies of instruction books covering most equipment. From these, descriptions of the equipment were written including basic operating data. Drawings were made of some equipment; and, in some cases, manufacturers furnished colored pictures, schematic drawings, and printed inserts.

Manual Double-Checked for Clarity

In preparing the manual, one engineer wrote the material and a second edited it to assure greater accuracy and clarity. Writers tried continuously to place themselves in the position of the trainees who would be seeing the material for the first time. As a result, two or three rewrites were required. Whenever possible, the material was submitted to the manufacturer for comments.

Because of errors and omissions and changes during construction, plans were made to revise the manual periodically.

"Complete" manuals were issued to most supervisors. Manuals issued to head watch engineers and

(*Continued on page* 171)

TRANSMISSION

DISTRIBUTION

GENERATION

10th annual electrical industry

FORECAST 1959 1975

POPULATION AND INCOME p 98

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INDUSTRIAL KWHR SALES p 105

INDUSTRIAL PRODUCTION p 103

COMMERCIAL SALES p 107

TOTAL KWHR SALES p 108

PEAK LOADS p 109

UTILITY CAPITAL SPENDING p 111

Arthur J Stegeman Manager, Market Research

a special report

Here's another completely new forecast for the electric utility industry based on an up-to-the-minute economic forecast by the McGraw-Hill Dept of Economics. As such it takes into account trends in the important areas of capital expenditures, construction, money market conditions, retail sales, and labor strife such as the current steel industry stand-off.

This critical analysis results in a brighter outlook for the electric utility industry. However, while our load forecasts are generally higher than a year ago, you'll find many shifts in timing and even more important, some shifting about in the requirements for various customer classifications.

Booming U. S. Population To Jump 33% By 1975 Boosting Total To 236 Million

Population growth is one of the more important barometers of our future economic weather. On one hand it indicates how many new consumers we can expect to be in the market for the ever expanding list of goods and services demanded by our standard of living. On the other hand it provides some idea of the work force available to supply these goods and services.

In terms of new consumers the outlook is definitely encouraging. In the post World War II period population gains averaged around 2.8 million a year compared with an average of 1.6 million a year in the first half of the century.

However, in recent years, despite a low level of family formations reflecting the baby drought of the depression years, population increased at an average rate of about 2.9 million people a year with one year, 1957, racking up an impressive 3.0 million increase.

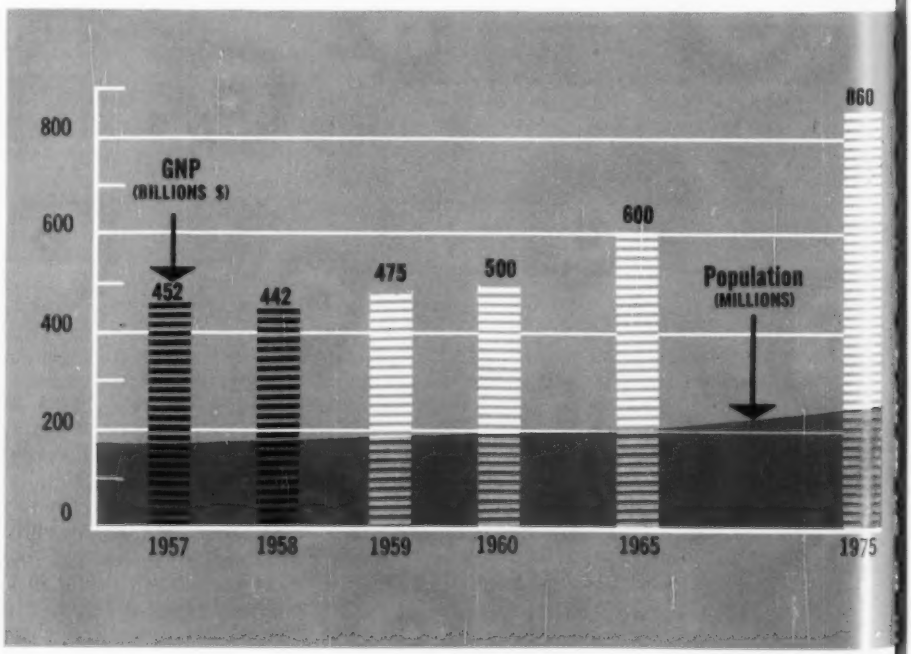
But these gains tell only half the story. By the mid 1960's these products of the post-war baby boom will themselves be contributing to the population thus sparking new life into our annual increases. This factor combined with the ever-lengthening life span of our older citizens will boost annual population gains to an average of 3.2 million by 1965. But this is only the beginning. By 1970 it's expected gains will average 3.5 million a year and by 1975 economists expect annual growth to be booming along at an unprecedented 4.0 million a year.

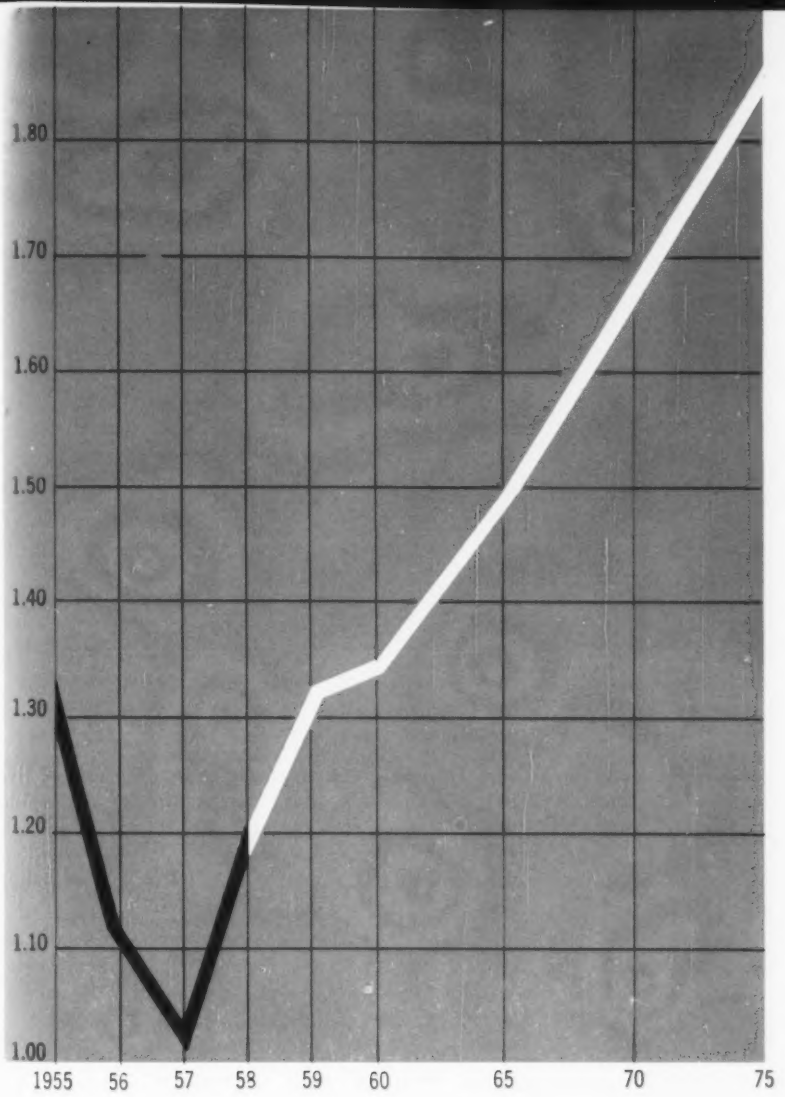
The sum total of these annual gains will boost our population to 196 million by 1965 and almost 236 million by 1975. This means that in the next 16 years our economy will be required to serve more than seven new consumer markets equal in size to New York City.

New family formations will naturally reflect the new population boom beginning in the mid 60's. From a current low level of about 700 thousand it now appears household additions will bounce back to around 900 thousand per year by 1963 and then

POPULATION & GROSS NATIONAL PRODUCT

(Billions of Dollars)





FORECAST 1958 1975

HOUSING STARTS
(Millions)

gradually increase each year to an annual rate of about 1.4 million by 1975.

These increases will boost our total household inventory to 56.1 million by 1965 and 67 million by 1975 compared with 51.2 million this year.

One important economic indicator influenced by household formations is the rate of new housing starts. Currently new home construction is on a binge reminiscent of the post-war boom when doubled up households were untangling. However, while this seems incongruous with the current depressed rate of family formations it serves to exemplify other factors having a bearing on the rate of new home construction.

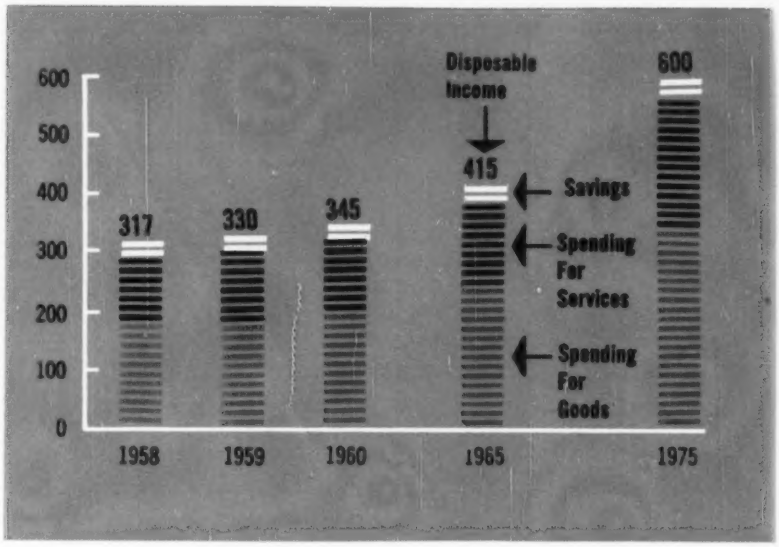
Probably the most important factor at this time is the increase in family size which necessitates the move to larger, more modern quarters than those purchased a few years back. Still another is the impact of population mobility which continues to shift families to the suburbs and even to entirely different sections of the nation. When these factors are combined with such government projects as urban renewal and interstate highway construction with its attendant housing demolition it's easier to understand why housing starts are at a current high rate of better than 1.3 million a year.

While it's doubtful the present rate of new home starts will show any appreciable pickup in the near future, economists predict gradual increases each year will boost housing starts to an annual rate of about 1.5 million by 1965, 1.7 million by 1970 and almost 1.9 million by 1975.

Gross National Product (the measure of the nation's overall output of goods and services) will expand with population. By 1975 economists predict GNP (in 1958 dollars) will hit $860 billion—81% over this year's expected record of $475 billion. To hit this level yearly gains will have to average around 5.1%. And this isn't unrealistic considering GNP in constant dollars has grown at an average rate of 3.5% a year since 1930 despite economic setbacks and major wars. But it does mean we will need many years such as 1955 when GNP skyrocketed 8.2%.

Almost 70% or $600 billion of 1975's GNP will become "consumer disposable income" to be spent

CONSUMER INCOME & SPENDING (Billions of 1958 Dollars)



on the many goods and services required to maintain a 1975 standard of living. This compares with the $330 billion consumers will have at their disposal this year.

And while a good deal of this 82% increase in disposable income will reflect population gains it also will reflect real increases in our standard of living. For instance, this year per capita disposable income will average out at about $1,862, compared with $1,542 in 1949, while in 1975 each individual will have $2,548 at his disposal for a gain of better than 36%.

RESIDENTIAL KWHR SALES

'59 Residential Sales Slated For 8.2% Gain; Average Use To Hit 3,563 Kwhr

Gains in consumer disposable income will play a big part in boosting residential sales in future years. With per capita disposable income up more than 36% by 1975 we can look forward to increasing consumer expenditures for the comfort and convenience of electric living. This will include such things as year-round electric heating and cooling, electric water heating and electric cooking in addition to the many new electric appliances that will probably be available by then.

It's conceivable that an industry-wide sales campaign for electric living could easily boost average residential customer use to better than 15,000 kwhr per year by 1975. In fact, there are areas today with a relatively high saturation of electrically heated homes where annual customer usage regularly exceeds 15,000 kwhr per year.

However, at this point our actual forecast is considerably more conservative. In fact, it can be considered the minimum we can expect by 1975. In that year it's estimated annual residential use of electric energy will hit 9,374 kwhr—an increase of 178% over last year's 3,366 kwhr.

This year average annual use is expected to increase at a slightly slower pace than it has in the past. Undoubtedly the reason for this slowdown is the depressed rate of appliance sales over the past few years and the business recession of 1957-58

which probably prevented many younger householders from acquiring, what is considered today, their normal complement of appliances. However, while there is a slight slowdown in the rate of growth the expected increase is anything but discouraging.

This year average residential use should increase by 197 kwhr (5.9%) to 3,563 kwhr. This compares with gains of 192 kwhr (6.0%) in 1958 and 205 kwhr (6.9%) in 1957.

But while this year's increase in average use isn't quite up to earlier expectations the stage is quietly being set for a comeback next year. It's no secret that appliance shipments have increased substantially over a year-ago thus far in 1959. However, in contrast to some previous years, the bulk of this production is ending up in the hands of consumers rather than in dealers inventory.

In addition a substantial boost in average residential use will come from the many new air conditioners bought these past few months as a result of heat waves in most sections of the country.

With strong pickup in appliance sales and a healthy outlook for the general economy through at least the major part of 1960, it's expected residential customers will boost their average use to 3,803 kwhr for a gain of 240 kwhr (6.7%) over this year.

Residential customer additions in 1959 will bounce back to about 1.1 million after sinking to a post-war low of 900 thousand last year. And while this isn't quite up to the 1.3 million and 1.2 million rates of 1956 and 1957 respectively it will serve to boost total residential customers to 48.9 million by year end.

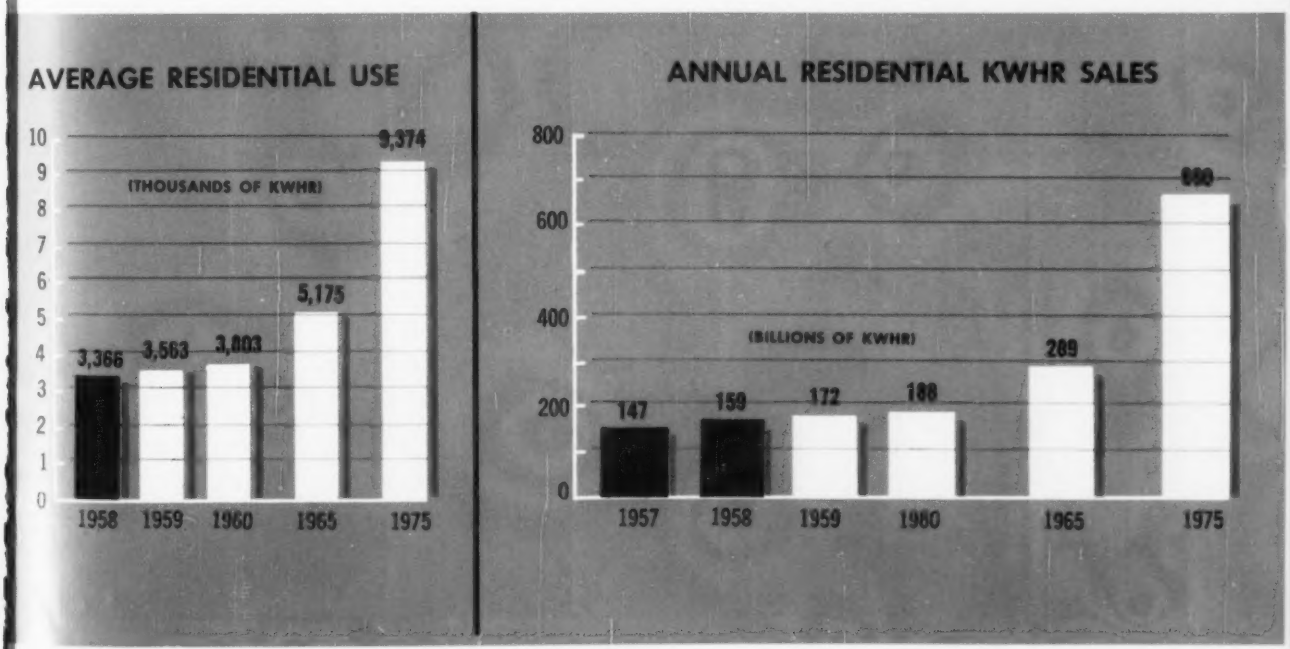
But just as household formations have passed through a depression induced slump so too have residential customer additions. From now on annual gains of 1.2 or 1.3 million new customers a year will boost the total to 56.5 million by 1965. Beyond that, new family formations resulting from the post war baby boom will boost residential customers to around 71 million by 1975. Even more important, residential customers will be increasing at about 1.7 million a year by that time.

Total residential sales, under the impact of new customers and increased average use, should increase 8.2% in 1959 to 172 billion kwhr. This is a gain of 196% over the last decade. The same factors will combine in 1960 to boost total residential sales about 9.4% to more than 188 billion kwhr.

By 1975 residential sales of electricity are expected to increase 315% over 1958 putting that year's total at almost 660 billion kwhr.

The average cost of electricity to residential customers will continue to decline. However, the rate of decline will not be as rapid as it has in the past due to the inflationary characteristics of our economy. But despite mounting rate increases, increased use by residential customers will gradually lower the average cost per kwhr.

This year's average kwhr rate will drop 1.2% to 2.50¢ from 2.53% in 1958. Next year the average rate will decline another 0.8% to 2.48¢. Between



Population, Households, GNP

	Population million	New Nonfarm Dwelling Units thousand	Households million	Gross National Product billion 1958 dollars	Consumer Disposable Income billion 1958 dollars
1949	149.2	1,025	42.5	323.8	230.2
1950	151.7	1,396	43.7	352.2	249.6
1951	154.4	1,091	44.8	378.6	253.0
1952	157.0	1,127	45.6	391.6	259.8
1953	159.6	1,104	46.4	408.7	272.7
1954	162.4	1,220	47.1	402.1	276.2
1955	165.3	1,329	48.0	434.9	296.1
1956	168.2	1,118	49.0	443.6	311.3
1957	171.2	1,042	49.7	452.0	316.4
1958	174.1	1,209	50.6	441.7	316.5
		FORECAST			
1959	177.2	1,325	51.2	475.0	330.0
1960	180.3	1,350	51.9	500.0	345.0
1961	183.4	1,375	52.6	510.0	350.0
1962	186.5	1,400	53.3	520.0	356.0
1963	189.6	1,425	54.2	550.0	375.0
1964	192.8	1,450	55.1	575.0	395.0
1965	196.0	1,500	56.1	600.0	415.0
1970	214.0	1,700	61.1	725.0	501.0
1975	235.5	1,850	67.0	860.0	600.0

1958 and 1975 the average cost will drop 4% to 2.40¢ per kwhr.

But while increased usage lowers the annual cost per kwhr to the residential customer it will also raise his average annual bill. This year's average bill will increase $3.92 to $89.08—still only about 1.4% of average household disposable income compared with 0.9% just ten years ago.

In 1975 the average residential bill will hit almost $225—153% more than this year, yet still only be about 2.5% of average household disposable income.

Utility revenues from residential electric service should increase 6.9% in 1959 to $4.3 billion. This compares with revenues of $1.7 billion registered in 1949. Next year residential electric revenues are expected to hit $4.7 billion—8.4% over this year.

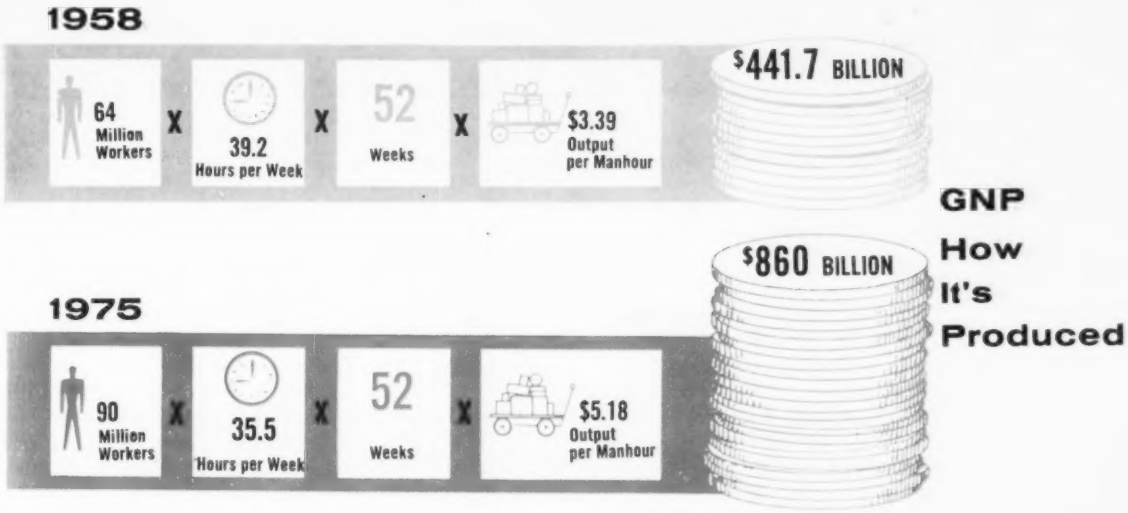
However, by 1970 residential electric revenues should be pouring in at the rate of about $15.8 billion a year for a jump of 268% over 1959's high of $4.7 billion.

Average Residential Use and Residential Sales

	Customers millions	Use Per Customer kwhr	Revenue per kwhr cents	Average Annual Bill	Sales billion kwhr	Revenue million dollars
1949	35.4	1,684	2.95	$ 49.68	58.1	$ 1,717
1950	37.5	1,830	2.88	$ 52.70	67.0	$ 1,932
1951	39.2	2,004	2.81	$ 56.31	77.0	$ 2,165
1952	40.7	2,169	2.77	$ 60.08	86.8	$ 2,401
1953	42.0	2,346	2.74	$ 64.28	97.1	$ 2,659
1954	43.1	2,549	2.69	$ 68.57	108.5	$ 2,920
1955	44.4	2,751	2.64	$ 72.63	120.5	$ 3,187
1956	45.7	2,969	2.60	$ 77.19	133.9	$ 3,477
1957	46.9	3,174	2.56	$ 81.25	147.1	$ 3,759
1958	47.8	3,366	2.53	$ 85.16	159.0	$ 4,025
			FORECAST			
1959	48.9	3,563	2.50	$ 89.08	172.1	$ 4,303
1960	50.1	3,803	2.48	$ 94.31	188.2	$ 4,667
1961	56.3	4,046	2.47	$ 99.94	205.1	$ 5,066
1962	52.6	4,296	2.46	$105.68	223.4	$ 5,496
1963	53.9	4,567	2.45	$111.89	243.4	$ 5,963
1964	55.2	4,860	2.43	$118.58	265.4	$ 6,476
1965	56.5	5,175	2.43	$125.75	289.3	$ 7,030
1970	63.5	7,015	2.41	$169.06	441.2	$10,633
1975	71.0	9,374	2.40	$224.98	659.9	$15,838

INDUSTRIAL PRODUCTION

Industrial Output To Increase 116% by '75



Another vital economic indicator associated with population and GNP is the Federal Reserve Board's Index of Industrial Production. As a measure of the physical output of our industrial complex it is an important contributor to the measure of our economic well being—GNP.

Economists tell us industrial production will have to increase 116% between 1958 and 1975 to produce the vast quantity of consumer and industrial goods required to support a larger population. Remember, by 1975 we will have 61.4 million more people to feed, clothe, shelter and entertain in a manner to which they are unaccustomed today.

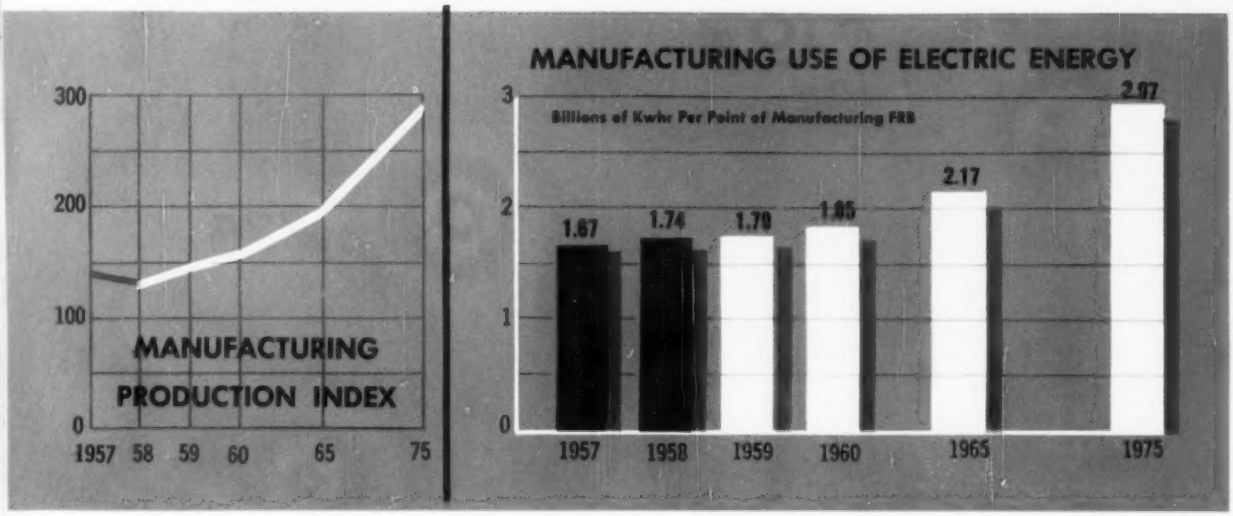
But while a swelling population will spark this expansion in output, it will not nearly provide the working force required to reach this production level at today's rate of productivity (output per worker). That's because from the mid-60's our total population will expand at both ends of the age scale but shrink in the middle. This means the labor force available to produce goods and services will not grow in proportion to the population.

Adding to the labor problem will be a reduction in the number of hours worked per week. With most labor unions already dedicated to reducing the average work week we can expect weekly hours to drop from 39.2 hours in 1958 to around 35.5 in 1975.

This drop in weekly hours coupled with a retarded growth in the labor force will result in a shortage of manhours. In other words, while total employment will climb 41% by 1975, available manhours will increase by only 27%.

The effect of this pinch in manhours can best be illustrated in terms of output per manhour. In 1958, 64 million workers on the job 39.2 hours a week, 52 weeks a year produced $442 billion of Gross National Product. This means that each manhour worked had to produce $3.39 of national product. But in 1975, 90.5 million workers will be called on to produce $860 billion of GNP at 1958 prices. To do this in a 35.5 hour week they will have to produce $5.18 of goods and services each and every manhour. This means overall output per manhour must increase almost 53%.

To hit this goal, productivity gains must average out at about 3.1% a year. While this objective may seem unrealistic, keep in mind that from 1930 to 1958 output per manhour increased an average 2.5% per year. But even more encouraging is the fact that in the decade ending last year productivity



gains averaged about 3.0% per year. Now with technological advances such as automatic production machinery, computer controlled assembly lines and even computer controlled plants coming along at an unbelievable rate it seems reasonable to count on productivity racking up an average yearly gain of 3.1% between now and 1975.

However, the real pinch in manhours will come in manufacturing since production workers will increase at an even slower rate than the total labor force. Economists tell us that manufacturing production will reach 294 on the FRB's index (1947-49 average = 100) by 1975 for a jump of 116% over last year.

Increased production per manhour means more machinery or modernization of existing machinery. That in turn means more kwhrs per manhour. In fact in 1975 the average worker will require 28.7 kwhr or 190% more electricity than the 9.9 kwhr he uses each hour he works today.

On the other hand, each point of manufacturing production will take fewer manhours. By 1975 only 105 million manhours will be needed for each point of the manufacturing production index. That's 40% less than last year when it took 175 million manhours for each point of production.

That adds up to 190% more electricity per manhour to cut manhours needed per unit of production by 40%.

In terms of electric energy consumed manufacturers used 1,356 million kwhr per point of the FRB production index in 1949 and 1,738 million kwhr per point in 1958 for a gain of 28%. But by 1975 use per point of the manufacturing index will hit 3,009 million kwhr—up 73% over last year.

Now here's what all this means in terms of total electric energy consumption by manufacturers. In 1975, with kwhr use per point of production up 73% and the volume of production up 116%, total manufacturing use should jump to about 873 billion kwhr —a gain of almost 270% over last year.

However, total industrial use of electric energy is swelled by other than manufacturers. Aluminum and magnesium producers also make a substantial contribution. From 1948, when 623 thousand tons of aluminum and 10 thousand tons of magnesium were produced, this load jumped almost 153% to 28.8 billion kwhr in 1958. And even this was below the peak use of 31.3 billion kwhr in 1956. But with industry economists predicting greatly expanded use of these "wonder" metals in future years we can count on an even greater contribution to industrial kwhr use from this area.

Forecasters predict 1975 aluminum production should be in the neighborhood of 4.3 million tons and magnesium production at about the 295 thousand ton level. That adds up to an 82.4 billion kwhr load in 1975—a good 186% jump.

Still another contributor to industrial sales is use by other industries such as mining, petroleum and government manufacturing. In 1948 these users consumed 19.9 billion kwhr. By last year this had increased over 73% to 34.5 billion kwhr. But by 1975 it's estimated consumption by this group will hit almost 116 billion kwhr for an increase of 236%.

The last big user to be added in is the Atomic Energy Commission. While kwhr purchases by AEC installations contributed greatly to the growth of industrial load in recent years they will not play a part in increasing industrial consumption in the future. This load which rocketed from 2.3 billion kwhr in 1948 to a peak of 57.8 billion kwhr in 1956 has now settled down to a steady 54.6 billion kwhr per year.

Adding up the contribution of these major groups we arrive at a total industrial kwhr use figure of 1.1 trillion kwhr by 1975. That's 218% over last year's use of 354 billion kwhr.

Primary source of this power will continue to be industrial or "large light and power sales" by the nation's electric utilities. By 1975 these sales will hit 946 billion kwhr—up 244% over 1958.

Industrial Sales To Spurt 11.6% In 1959

Electric utility industrial sales for 1959 appear to be heading for a new record of almost 307 billion kwhr. That's a jump of almost 11.6% over last year's 275 billion kwhr. Even more important it's an increase of 8.5% over the pre-recession 1957 peak of almost 283 billion kwhr.

In 1960 we look for a gain of 9.5% to push total industrial sales to almost 336 billion kwhr.

Here's what's behind this rosy forecast. Industrial load growth went on a healthy binge the first six months of 1959. After chalking up a somewhat disappointing 2.7% decline for the year in 1958, industrial sales bounced back to a 12.2% increase over a year ago in the first six months of '59. Over this same period industrial production as measured by the FRB index racked up a 13% gain.

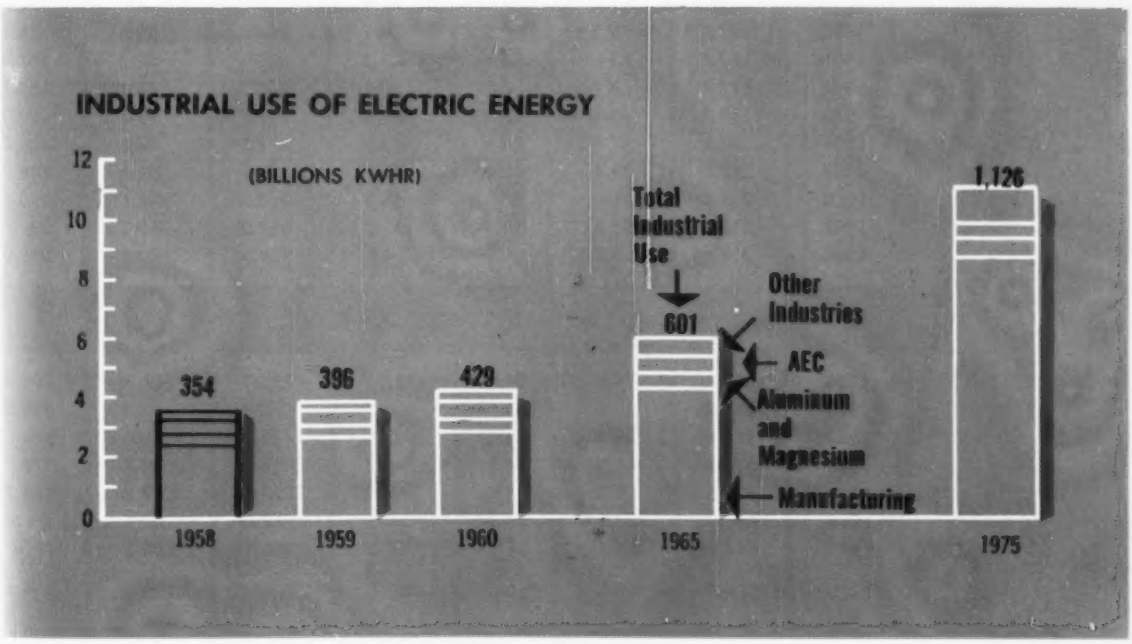
What's more important though is that our economists expect production to boom along a good clip in the last quarter of the year despite some feelings in economic circles that '59's first-half production was artificially created in anticipation of the much publicized steel strike. However, McGraw-Hill economists, while acknowledging a certain amount of steel inventory buildup point out that the ratios of business inventories to sales and inventories to new orders have been declining despite inventory buildup. The point is that inventories are not excessive in relation to the volume of business being done. And unless some economic catastrophe happens along, business should continue at a healthy clip through the remainder of the year and on into 1960.

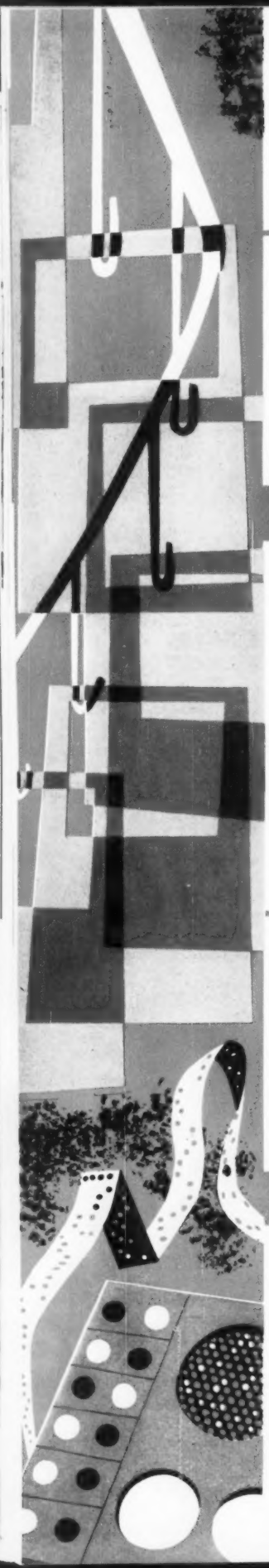
Statistically our economists predict 1959 industrial production will average out at 147 on the FRB index—9.7% ahead of 1958.

At this rate manufacturing production will post a gain of 10.3% for the year and total industrial consumption should add to almost 396 billion kwhr—up 11.6% over last year.

Behind next year's prediction is a reasonable expectation of further increases in retail sales with rising consumer disposable income, an upswing in industrial capital expenditures as manufacturers inch up to optimum operating rates and at least as good a year for automobiles as 1959 is slated to be.

This combination should serve to boost industrial sales of electric energy to 335.8 billion kwhr for a gain of 9.5% over this year.





Indices of Industrial Activity

	Industrial Production 1947 – 49 = 100	Manufacturing Production 1947 – 49 = 100	Manufacturing Manhours billions	Primary Aluminum Production thousand tons	Primary Magnesium Production thousand tons
1949	97	97	23.6	603	12
1950	112	113	25.9	719	16
1951	120	121	27.9	837	41
1952	124	125	27.7	937	106
1953	134	136	29.1	1,252	93
1954	125	127	26.0	1,461	70
1955	139	140	27.7	1,566	61
1956	143	144	27.7	1,679	68
1957	143	145	26.7	1,649	81
1958	134	136	23.8	1,566	30
FORECAST					
1959	147	150	25.8	1,866	45
1960	157	160	26.5	2,025	55
1961	162	165	26.6	2,112	70
1962	165	168	26.6	2,281	85
1963	182	185	27.4	2,475	95
1964	189	192	27.8	2,698	110
1965	197	200	28.0	2,941	125
1970	240	244	29.3	3,650	200
1975	290	294	30.4	4,250	295

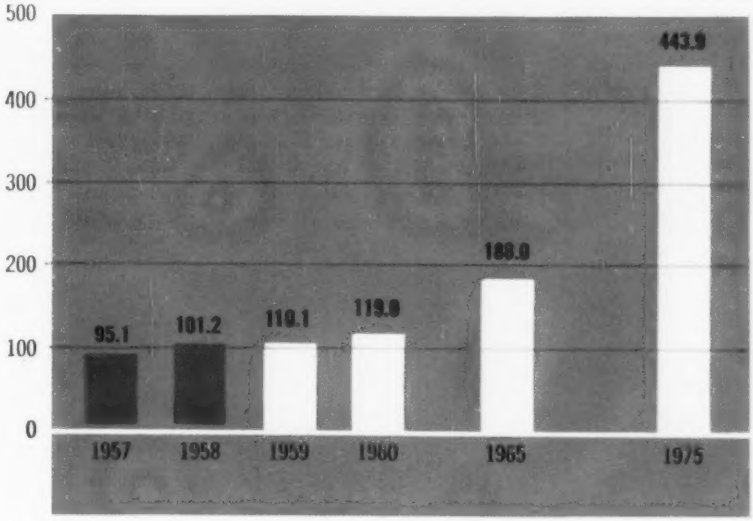
Industrial Use of Electric Energy (billion kwhr)

	Manufacturing Use	Aluminum and Magnesium	AEC Use	Other Industries	Total Industrial Use	Generation by Industrial Plants	Utility Industrial Sales
1949	139.7	11.1	2.2	21.7	174.7	54.0	120.8
1950	157.9	13.3	2.5	24.9	198.6	59.5	139.1
1951	174.8	15.8	3.7	26.2	220.5	62.7	157.8
1952	177.7	18.7	6.7	28.1	231.2	63.8	167.4
1953	195.3	24.3	12.5	29.4	261.5	71.5	190.0
1954	192.1	27.7	23.4	30.0	273.2	73.0	200.2
1955	222.2	29.4	46.6	33.0	331.2	82.0	249.2
1956	235.0	31.6	57.8	36.3	360.7	84.1	276.6
1957	242.2	31.3	56.6	36.9	367.0	84.3	282.7
1958	236.4	28.8	54.6	34.5	354.3	79.3	275.0
FORECAST							
1959	269.1	34.5	54.6	37.3	395.5	88.7	306.8
1960	296.2	37.6	54.6	40.3	428.7	92.9	335.8
1961	315.2	39.4	54.6	43.3	452.5	95.6	356.9
1962	331.1	42.8	54.6	46.5	475.0	96.7	378.3
1963	376.3	46.5	54.6	49.9	527.3	103.2	424.1
1964	403.0	50.8	54.6	53.6	562.0	105.5	456.5
1965	433.2	55.4	54.6	57.5	600.7	108.1	492.6
1970	618.8	69.7	54.6	81.7	824.8	138.4	686.4
1975	872.6	82.4	54.6	115.9	1,125.5	179.8	945.7

ommercial Sales Heading For 8.8% Gain in '59

New customers with bigger electric loads should boost average annual commercial use of electricity 7.3% to 17,361 kwhr in 1959. And with commercial building construction and modernization expected to continue at a good clip in 1960 average commercial use should hit 18,413 kwhr—up 6.1%.

Total commercial sales in 1959 will ring up an 8.8% gain over 1958. Another 8.1% boost in 1960 will raise the annual total to 119 billion kwhr. In 1975 sales should hit 444 billion kwhr.



COMMERCIAL KWHR SALES

Commercial and Other Sales

	Commercial Customers thousand	Average Annual Use per Customer kwhr	Commercial Sales billion kwhr	Rural Sales billion kwhr	Street & Highway Lighting Sales billion kwhr	Other Public Authority Sales billion kwhr	Railway & Railroad Sales billion kwhr	Inter-departmental Sales billion kwhr
1949	5,291	8,871	46.3	7.4	2.7	6.6	6.1	0.6
1950	5,466	9,320	50.4	7.4	3.0	7.2	5.9	0.6
1951	5,528	10,432	57.3	8.5	3.3	8.0	5.8	0.5
1952	5,634	11,106	62.1	8.5	3.5	8.4	5.4	0.5
1953	5,863	12,007	69.2	9.6	3.8	9.0	5.0	0.6
1954	5,992	12,353	73.4	10.2	4.0	9.4	4.7	0.6
1955	6,042	13,422	80.8	10.8	4.4	10.2	4.6	0.6
1956	6,125	14,395	87.7	11.1	4.7	11.0	4.4	0.6
1957	6,187	15,432	95.1	11.3	5.1	11.8	4.1	0.6
1958	6,281	16,181	101.2	11.1	5.5	12.8	3.8	0.6
FORECAST								
1959	6,396	17,361	110.1	12.3	5.9	14.0	3.8	0.6
1960	6,530	18,413	119.0	12.0	6.3	14.9	3.8	0.6
1961	6,684	19,636	129.7	12.2	6.8	16.1	3.8	0.6
1962	6,858	20,942	141.8	12.5	7.4	17.3	3.8	0.6
1963	7,042	22,482	156.3	12.9	8.1	18.5	3.8	0.6
1964	7,236	24,011	171.4	13.2	8.9	19.7	3.8	0.6
1965	7,430	25,644	188.0	13.6	9.8	20.9	3.8	0.6
1970	8,290	35,465	291.0	15.8	14.9	28.1	3.8	0.6
1975	9,226	48,591	443.9	18.3	22.6	37.8	3.6	0.6

'59 Sales To Hit 626 Billion Kwhr – Up 9.9%

Industry-wide sales of electric will add up to almost 626 billion kwhr this year for a gain of 9.9% over the 569.2 billion kwhr consumed in the recession hit year 1958. Last year's sales, incidentally, chalked up an encouraging 2.0% gain over 1957 despite the recession.

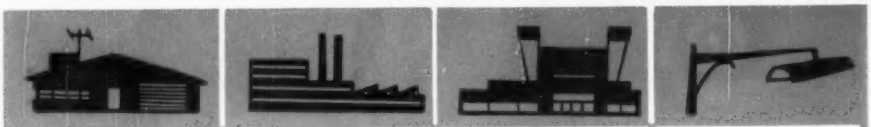
By the end of 1960 energy sales will climb another 55 billion kwhr or 8.8% to 681 billion kwhr. This means that in the decade ending next year total energy sales will have chalked up a gain of 142%.

In the next ten year period energy sales are slated to jump almost 118% to 1.5 trillion kwhr in 1970. And by 1975 sales are expected to hit 2.1 trillion kwhr for a gain of 275% over 1958.

Residential kwhr will continue to become a more important share of total sales. After slipping to 15% of the total during World War II residential sales have steadily increased their share of the total hitting a high of 27.9% last year. Continued gains are expected to boost residential sales to 30.9% of total sales in 1975.

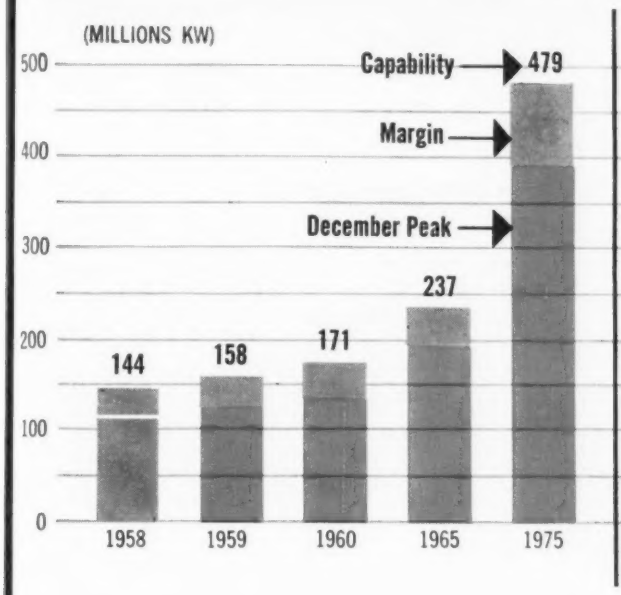
The increase in residential's slice will be at the expense of "industrial's" share of the total. These have only held their own at about 50% during the last 10 years despite the rapid increase in AEC use. Now with AEC use no longer a growth factor we expect "industrial's" share to slip to about 44.3% by 1975 as compared with this year's 49.0%.

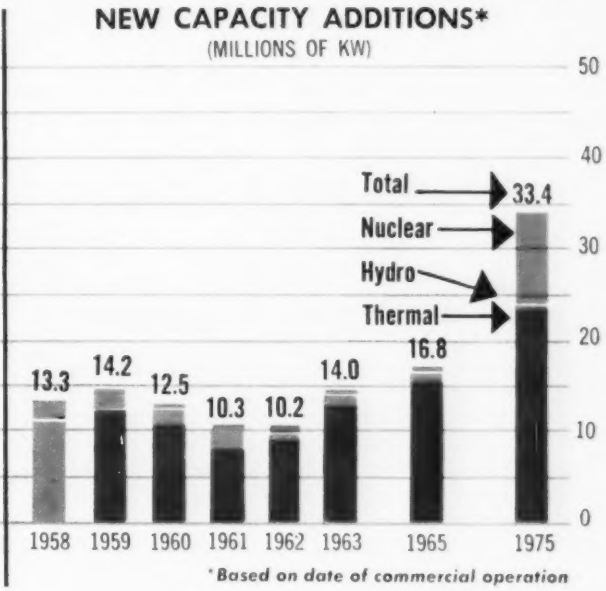
Total Electric Energy Sales (billion kwhr)



	Residential		Industrial		Commercial		"Other"		Total
	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales	(% total)	Sales
1949	58.1	23.4	120.8	48.6	46.3	18.6	23.4	9.4	248.5
1950	67.0	23.9	139.1	49.5	50.4	18.0	24.0	8.6	280.5
1951	77.0	24.2	157.8	49.6	57.3	18.0	26.0	8.2	318.2
1952	86.8	25.3	167.4	48.9	62.1	18.1	26.3	7.7	342.5
1953	97.0	25.2	190.0	49.5	69.2	18.0	28.0	7.3	384.2
1954	108.5	26.4	200.2	48.7	73.4	17.9	28.9	7.0	410.9
1955	120.5	25.1	249.2	51.8	80.8	16.8	30.4	6.3	480.9
1956	133.9	25.3	275.7	52.1	87.7	16.6	31.9	6.0	529.2
1957	147.1	26.4	282.7	50.7	95.1	17.0	32.9	5.9	557.9
1958	159.0	27.9	275.0	48.3	101.2	17.8	34.0	6.0	569.2
FORECAST									
1959	172.1	27.5	306.8	49.0	110.1	17.6	36.6	5.9	625.6
1960	188.2	27.7	335.8	49.3	119.0	17.5	37.6	5.5	680.6
1961	205.1	28.0	356.9	48.8	129.7	17.7	39.5	5.4	731.2
1962	223.4	28.5	378.3	48.2	141.8	18.1	41.6	5.3	785.1
1963	243.4	28.1	424.1	48.9	156.3	18.0	43.8	5.0	867.6
1964	265.4	28.2	456.5	48.6	171.4	18.2	46.2	4.9	939.5
1965	289.3	28.4	492.6	48.4	188.0	18.5	48.6	4.8	1,018.5
1970	441.2	29.8	686.4	46.3	291.0	19.6	63.2	4.3	1,481.8
1975	659.9	30.9	945.7	44.3	443.9	20.8	83.0	4.0	2,132.5

PEAK LOADS AND CAPACITY





*Based on date of commercial operation

Winter Peak Slated For 10.6% Gain This Year

Satisfying the electrical appetites of Class I utility systems' customers in 1959 will require production of some 706 billion kwhr (626 billion in sales, plus line losses)—10% more than the 641 billion kwhr spun out last year. And next year's sales of 681 billion kwhr will eat up another 8.9% increase to boost annual production to more than 768 billion kwhr—more than double 1951's 371 billion kwhr.

In 1975 our electric energy needs will require utilities to generate more than 2.4 trillion kwhr, or 243% more than the 706 billion kwhr in the cards for 1959.

Barring an unforeseen economic collapse, this year's December peak loads on the nation's Class I utility systems should increase about 12 million kw to 125.4 million kw. That will add up to a 10.6% gain over last year. A more modest gain of 8.9% in 1960 is expected to boost the winter peak 11.2 million kw to 136.6 million kw.

By 1975 it is expected winter peaks will be up around 393 million kw—213% higher than this year's estimated peak of 125.4 million kw. And while this 213% gain may seem optimistic keep in mind that this year's peak load is 145% higher than the 51.1 million kw recorded just eleven years ago in 1948.

Although additions to generating capacity are scheduled at a record 14.2 million kw in 1959 the stage has already been set for a lower rate of additions over the next few years. Based on current orders and potential requirements over the next few years, total capacity additions will be about 12.5 million kw in 1960, 10.3 million kw in 1961 and 10.2 million kw in 1962.

However, by 1963, additions to the nation's generating capacity should once more be on the rise with that year's construction totalling around 14 million kw. From the long range standpoint, growth in peak loads and an increasing rate of retirement for older generating units is expected to peg 1975 additions at somewhere around 33 million kw.

Conventional steam plants will still account for the bulk of capacity additions both in the near and distant future. Here though it's interesting to note that conventional steam additions will fall from a high of 12.6 million kw in 1959 to a low of 7.6 million kw in 1961. On the other hand, hydro-plant additions will increase from 1.6 million kw this year to 2.4 million kw in 1961.

These capacity additions will boost the nation's generating capability to 158.4 million kw in 1959—more than double the 76.2 million available at the end of 1951. By 1965 capability is slated to hit about 237 million kw and, by 1975, 479 million kw—203% more than this year.

As a result of the high rate of capacity additions over the last few years, the December reserve margin in 1959 will show only a slight decline from last year's high of 27.1% (30.8 million kw) to 26.5%. However, the coming fall-off in capacity additions

Comparison of Electrical World and Federal Power Commission Forecasts

	Output (Billions Kwhr)		Peak Loads (Millions Kw)		Generating Capacity (Millions Kw)	
	FPC	EW	FPC	EW	FPC	EW
1958	651	641	120.3	113.4	142.4	144.2
1960	800	768	145.3	136.6	167.0	170.9
1965	1,064	1,153	193.9	194.1	223.0	236.8
1970	1,349	1,682	245.7	276.0	283.0	336.8
1975	1,668	2,423	303.7	392.6	349.0	479.0

Note: FPC output, peak loads and capacity are total industry. Electrical World data is for Class 1 systems representing more than 98% of the industry. Capacity figures represent capability.

combined with increases in peak loads will drop December reserve margins to 24.2% in 1960, 23.9% in 1961 and finally to 22.0% in 1962. This latter figure, incidentally, is what we consider an "ideal" winter margin considering the impact of increasing summer peak loads in many areas of the country.

The fact is, this traditional December reserve margin becomes increasingly less meaningful as more utility systems swing over to summer peaks. This is especially true since many regions with summer peaks are geographically so far removed from winter peak areas that interconnections to shift reserves from one system to another are physically impossible. For example, in December 1958, the Pacific Northwest had a reserve margin of 31.3% while the South Central region's was 65.2%. In the summer of 1958 the situation was somewhat reversed with the Pacific Northwest holding a reserve of 40.1% and South Central 23.6%.

With this situation in mind it appears a more realistic picture of the nation's reserve margin can best be calculated by measuring each utility system's, or interconnected system's, reserve capacity at the time the annual system peak occurs.

Applying this approach to Edison Electric Institute's Annual Power Survey data on a regional basis reveals the following relationship between December reserve margins and calendar year margins.

Based on reported operating results, calendar year reserves for the nation's utility systems were 17.7% and 23.1% in 1957 and 1958 respectively. This compares with reported December margins of 22.2% and 27.1% in those same years. On the other hand summer reserve margins were reported as 19.3% in 1957 and 25.9% in 1958.

Calculating 1959 calendar-year peaks and capabilities from utility-supplied data published in the EEI April 1959 Power Survey yields a reserve margin of 22.9% as compared with a predicted December margin of 27.5%.

Electric utility load factor (a measure of utilization of generating capability) which has gradually increased over the years from 61.9% in 1948 to 64.5% last year will continue to inch up. It's expected that increased use of year-round electric heating and cooling installations plus use of other year-round electric appliances will gradually boost load factor to 67.8% by 1965 and 70.9% by 1975.

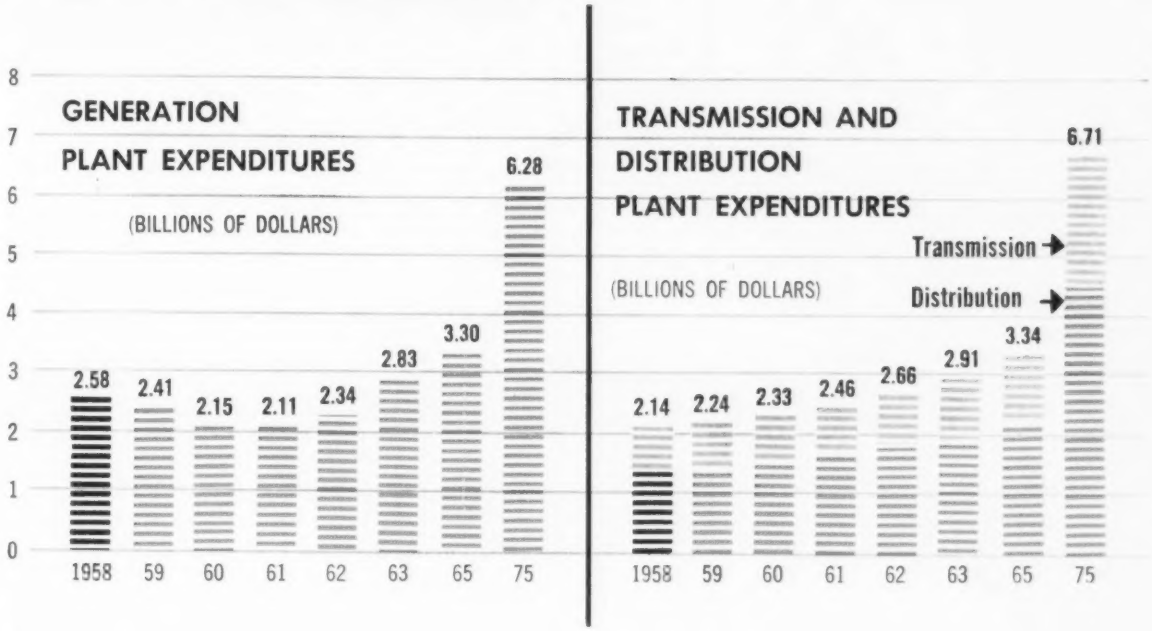
New Capacity Additions*

(THOUSANDS OF KW)

	Thermal	Hydro	Nuclear	Total
1958	10,893	2,353	0	13,246
1959	12,588	1,631	0	14,219
1960	10,298	1,831	414	12,543
1961	7,631	2,391	315	10,337
1962	8,740	1,224	268	10,232
1963	12,623	1,100	250	13,973
1964	13,975	1,100	300	15,375
1965	15,219	1,100	500	16,819
1970	19,812	1,100	2,500	23,412
1975	23,787	1,100	8,500	33,387

*Based on date of commercial operation.

UTILITY CAPITAL SPENDING



Generation To Trim '60 Budgets 4.1% But Distribution Spending To Gain 9.6%

Total electric utility construction expenditures in 1959 are holding at the record 1958 rate of $4.9 billion as reported in Electrical World's Annual Survey of Electric Utility Construction Expenditures last January. However, next year total spending is expected to fall off 4.1% to $4.7 billion, just about the same rate as in 1957.

By 1961 the rate of capital expenditures will increase a slight 2.2% to $4.8 billion. Continued gains will boost spending to $6.9 billion by 1965 and, by 1975, electric utility construction plans will require the expenditure of about $13.5 billion—around 175% more than this year's high of $4.9 billion.

Spending for new generating facilities will be down almost $200 million this year despite the addition of a record 14.2 million kw of new generating capacity. However, this 6.6% drop from last year's high of $2.6 billion reflects the drop off in the rate of new capacity additions slated from now through 1962. In fact, next year's expenditures for generation will drop another 11% or $266 million to $2.1 billion. An additional 1.7% decline will take place in 1961 before the expected pickup in capacity additions in 1963 reverses the downtrend.

By 1975 the addition of almost 33 million kw of new generating capacity will call for generation expenditures in the neighborhood of $6.3 billion or 143% more than the 1958 high of $2.6 billion.

Transmission plant expenditures for 1959 are scheduled at $788—3.1% ahead of 1958 due to the shifting of some 1958 projects into 1959. However, in 1960 the slowdown in new generating capacity additions will hit this area and spending will drop about 7% to $732 million. This will only be a temporary dip though since transmission spending figures to climb back up to $752 million in 1961.

Continued decentralization of population and industrial centers in 1975 will require transmission expenditures to climb to an estimated $2.1 billion.

New distribution plant requirements are pegged at $1.5 billion this year for a gain of 6.0% over 1958. But next year, under the impact of a high rate of new home construction and further substantial gains in residential and commercial kwhr sales, it's expected distribution spending will jump 9.6% to almost $1.6 billion.

With system reliability due for upgrading in line with increases in all-electric living it's expected distribution plant expenditures will hit about $4.6 billion in 1975—a good 215% over this year.

Output, Peak Loads, Capability

	Output billion kwhr	Winter Non-Coincident Peak Load million kw	Load Factor %	Capability million kw	Gross Margin % Peak
1949	287.7	54.0	60.8	61.7	14.2
1950	328.6	62.0	60.9	68.4	10.3
1951	370.8	68.1	62.1	76.2	11.8
1952	398.3	72.8	62.2	81.5	11.9
1953	441.2	78.4	64.2	92.4	17.8
1954	471.9	85.7	62.8	103.7	21.0
1955	542.6	97.9	62.1	116.1	18.6
1956	597.2	102.4	65.1	122.6	19.7
1957	626.7	106.9	66.9	130.6	22.2
1958	641.1	113.4	64.5	144.2	27.1
FORECAST					
1959	705.5	125.4	64.2	158.4	26.5
1960	768.2	136.6	64.2	170.9	24.2
1961	825.9	145.9	64.6	181.2	23.9
1962	887.4	156.8	64.6	191.3	22.0
1963	981.4	168.1	66.6	205.1	22.0
1964	1,063.4	180.5	67.3	220.3	22.0
1965	1,153.4	194.1	67.8	236.8	22.0
1970	1,681.6	276.0	69.6	336.8	22.0
1975	2,423.4	392.6	70.5	479.0	22.0

Data in this table is for Class 1 Systems. These operate about 97% of the nation's generating capacity. All other data (kwhr sales, capital spending, etc.) is industry-wide.

Construction Expenditures

	Generation	Transmission	Distribution million dollars	Miscellaneous	Total
1949	$1,410	$400	$1,190	$93	$3,093
1950	$1,275	$425	$1,127	$109	$2,936
1951	$1,344	$504	$1,089	$131	$3,068
1952	$1,925	$577	$1,118	$118	$3,738
1953	$2,088	$647	$1,200	$127	$4,062
1954	$1,939	$666	$1,288	$122	$4,015
1955	$1,547	$571	$1,343	$161	$3,622
1956	$1,479	$598	$1,518	$186	$3,781
1957	$2,234	$747	$1,566	$199	$4,746
1958	$2,582	$764	$1,373	$187	$4,906
FORECAST					
1959	$2,412	$788	$1,455	$197	$4,852
1960	$2,146	$732	$1,595	$179	$4,652
1961	$2,110	$752	$1,709	$183	$4,754
1962	$2,341	$822	$1,842	$200	$5,205
1963	$2,827	$935	$1,972	$229	$5,963
1964	$3,062	$1,007	$2,112	$247	$6,428
1965	$3,298	$1,081	$2,262	$266	$6,907
1970	$4,652	$1,530	$3,211	$376	$9,769
1975	$6,277	$2,122	$4,587	$519	$13,505

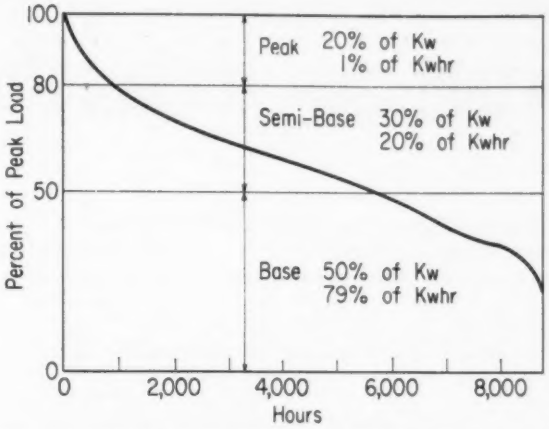


FIG 1—**ANNUAL LOAD-DURATION CURVE,** with approximate percentage of kw and kwhr in each zone, was basic

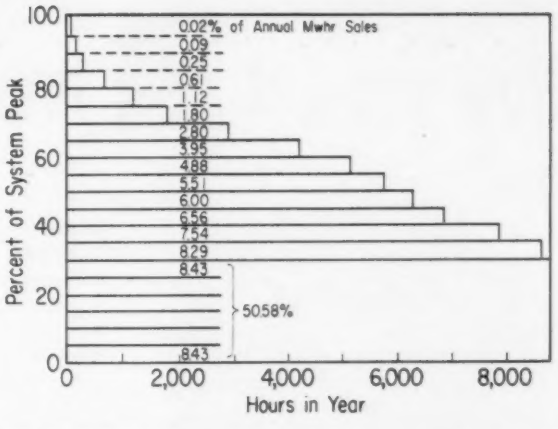


FIG 2—**BLOCKS** of energy in each 5% of system peak load were computed from Fig 1. Base load is lowest portion

Small Units Give Low-Cost Peaking

R. C. R. SCHULZE, Assistant Chief Engineer, Atlantic City Electric Co, Atlantic City, N. J.

Small-capacity units are the most economical, adequate replacement for old steam turbine-generators which should be retired from a system in which they could still supply power, although at a high cost. Retirement of such expensive-to-run units constitutes a reduction in system capacity which must be made up.

Instead of all or part of the next large high-pressure, high-temperature steam turbine-generator, such replacement capacity could be a unit for peaking. Any outlay for peak kw capacity is economical when it is designed specifically for operation during only a relatively few hours each year.

Among replacement-capacity units available are a medium-pressure steam unit, a gas turbine, diesel engines, pumped storage or, in fact, any other form of power generation suitable to a particular situation. It should be noted that among these the small peak-shaving generating units proffer significant savings over conventional large turbine-generators. Of these several ideas, the better ones for most situations are the diesel generator and the gas turbine.

Most studies of generating facilities on a power system deal only with time, size, and location of the next unit. But this study looks at the overall generation program as it extends into the future and especially at the shape of the annual load-duration curve. It examines the type of generation facility best suited to supplying kw and kwhr in each of the several zones into which the load-duration curve can be divided. Fig. 1, a typical load-duration curve, shows approximate percentages of kw and kwhr in each zone.

From this curve, blocks of energy in each 5% of the system peak load were computed. These are the figures in Fig. 2, where it appears that

(*Continued on page* 116)

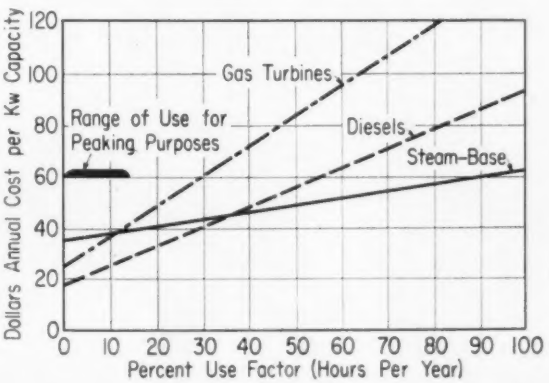


FIG 3—**ANNUAL COST** per kw of capacity (fixed + fuel) is compared with percent use factor (hours use in a year)

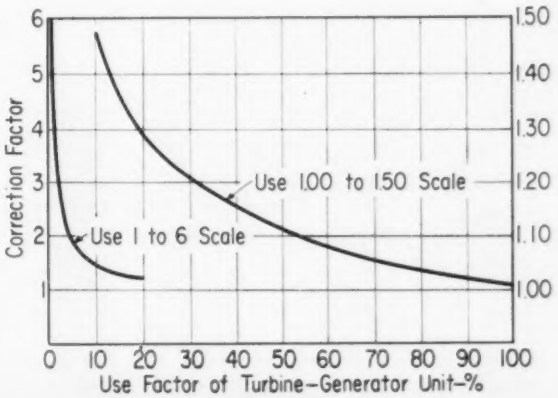


FIG 4—**HEAT RATE CORRECTION FACTOR** for large turbine-generator unit indicates available savings in fuel costs

Now you get 2 important new features on G

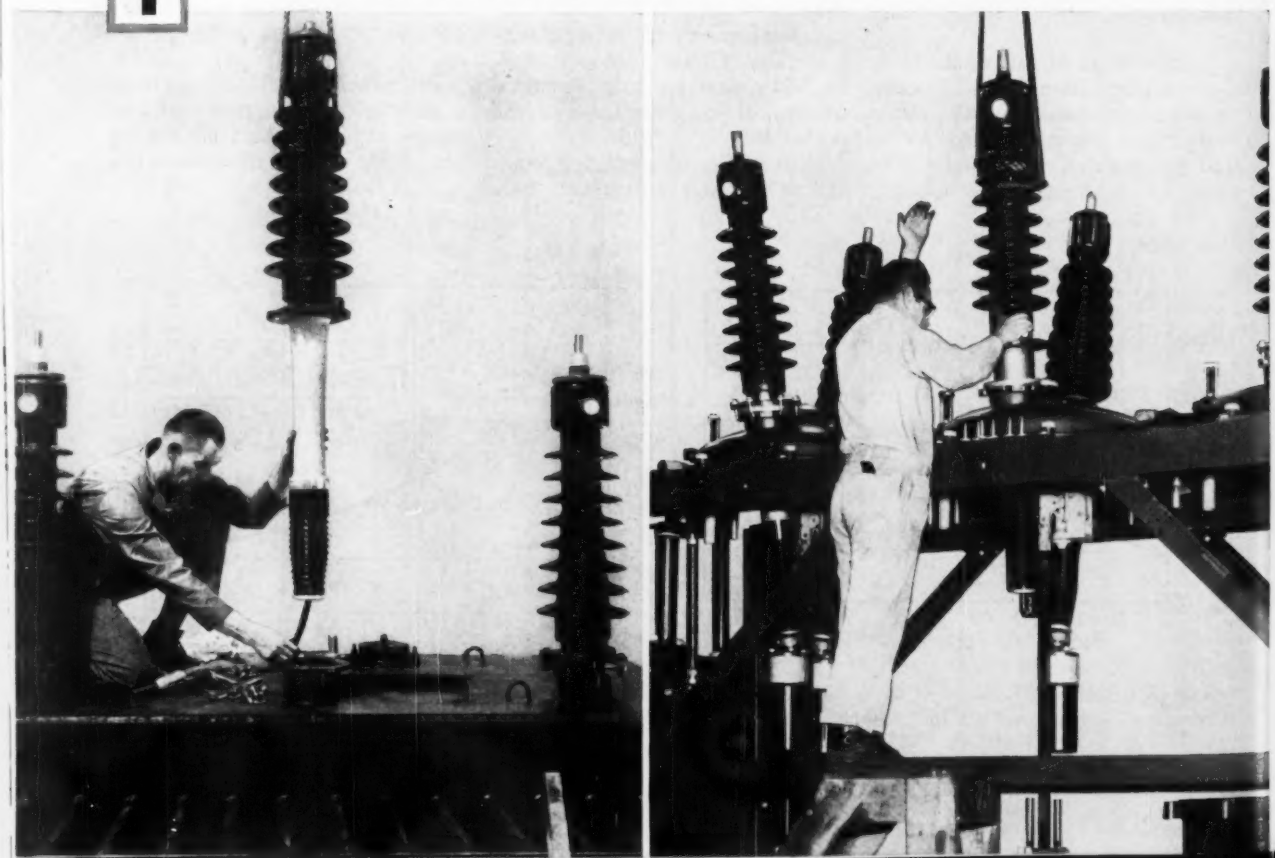
Here's how General Electric has solved two long-standing industry problems. Now, General Electric offers standard bushings interchangeable between medium* transformers and circuit breakers—4 standard designs where 24 previously were needed—that meet American Standards for bushings. General Electric also makes available a direct-acting mechanical pressure-relief device which gives tank protection from excessive internal pressures at all times. Both of these new features are now standard on all G-E medium transformers. Here is what each of these new features means to you . . .

INTERCHANGEABLE BUSHINGS. In addition to inventory reduction, these bushings permit conversion from draw-lead transformer application to bottom-connected breaker application by changing only the top terminal hardware. These General Electric Type U bushings include such features as lined-tapered core, completely oil-filled, oil-level indication, power-factor test tap, and center-clamped construction. Four basic designs are completely interchangeable between medium transformers and circuit breakers in 400- and 1200-ampere ratings, 25 through 69 kv.

NEW PRESSURE-RELIEF DEVICE. Diaphragmless, shockproof, corrosion-resistant throughout, self-reclosing, and self-resetting are characteristics of the new G-E design. This simple, rugged device, made

* 501 to 7500 kva, 69 kv and below.

1 INTERCHANGEABLE BUSHINGS



G-E medium transformers

of aluminum castings and stainless steel machined parts, is designed to eliminate breakage, thereby preventing fragments from falling into the transformer.

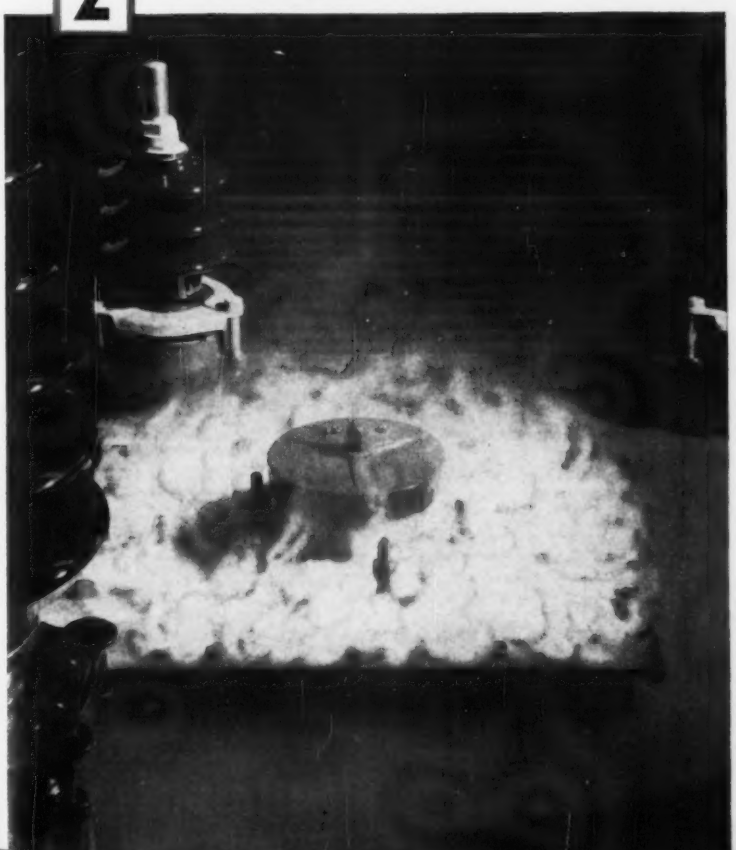
Product leadership is just one part of our story. General Electric medium transformers are certified to deliver **full value** for your transformer dollar . . . in terms of superior products . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. When deciding on your next medium transformer, examine the **complete "package"** offered by General Electric. When you do, we're confident you'll recognize G-E superiority and how you get full value for your transformer dollar.

For full information and application help on Certified Full-value medium transformers, see your G-E Apparatus Sales Engineer. General Electric Co., Schenectady 5, N. Y. 416-23

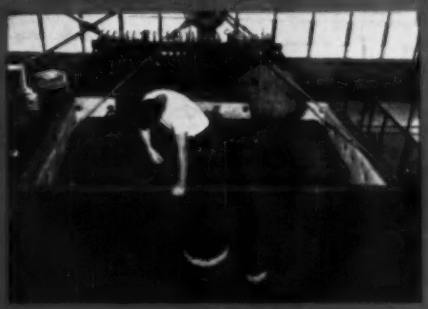
Progress Is Our Most Important Product

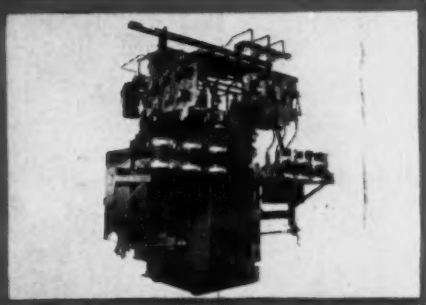
GENERAL ELECTRIC

2 PRESSURE-RELIEF DEVICE



FULL VALUE FOR YOUR TRANSFORMER DOLLAR





SUPERIOR DESIGN, FEATURES, AND PERFORMANCE of General Electric transformers is typified by pre-fabricated enclosure (above) and super-compact substation with medium transformer (below).

FASTER SHIPMENT through rapid processing of orders . . . computer design capability . . . repetitive manufacturing facilities.

COMPLETE SERVICE . . . application and systems engineers . . . installation engineers . . . 50 conveniently located service shops.

Small Units Give Low-Cost Peaking (*Continued from page* 113)

50% of the kwhr sold are produced by the first 30% of the kw capacity, the real "base load," which exists for all 8,760 hr in the year. Conversely, the top 20% of kw, the peaking capacity, produces only 1% of the total energy sales.

In fact, the peak 5% of the generation investment is utilized only a few hours during the year. Accordingly, it is not economical to spend much capital for such peak kw capacity.

How Curve Is Zoned

The area under the load-duration curve (Fig 1) has three general zones. The lower zone up to perhaps 50% of the annual peak load is that block of energy (kwhr) which should be generated by base-load facilities. The curve's top area, from 100 down to 80% of the peak, is the peak-load zone, and that part of the curve between 50 and 80% is the semi-base zone.

For our particular system, about 79% of the kwhr is in the base zone, 20% in the semi-base zone, and 1% in the peak zone. As the kw limits of 50% and 80% are somewhat arbitrarily chosen, either one or both can be adjusted slightly up or down without serious effect on the results.

In the economical provision of peaking capacity, low first cost is an important factor. It is of less importance that usually the fuel cost is higher than for base-load units. But a base-load unit must have a low fuel cost, and this low fuel cost must be achieved through heat-recovery equipment. Such equipment increases the capital cost.

In Fig 3 it is apparent that the large conventional high-pressure, steam turbine-generators, such as are installed today, are definitely the most economical type of generating unit for supplying blocks of load with high—i.e., over 40%—load factors on the basis of the unit costs used in this study. These units have a high capital cost, but a comparatively low fuel cost.

Diesels Economical

For low use factors, diesel generators have a lower total cost per kwhr. Although they have a low first cost—as low as half of a large steam unit's—their fuel cost is higher. There are two reasons for this: The heat rate of a diesel is about 11,000 BTU per kwhr, about 25% higher than the largest steam unit's; and, the diesel fuel price exceeds that of coal.

Gas turbines are also economical peak-load units, but only for use factors under 10 to 15%, and even then they cost more than diesels. Their prime advantage lies in the fact that a single unit can be built large enough to supply 20,000 or more kw.

These conclusions are apparent in Fig. 3. There are two distinct types of generating units, base-load and peak-load machines. Large steam turbine generators are ideal base-load machines. Diesels, because of their low first cost, not-excessive fuel cost, lower rating per unit, and their ability to come up to full load very quickly, are ideal for supplying system peaks.

Use Factors Better

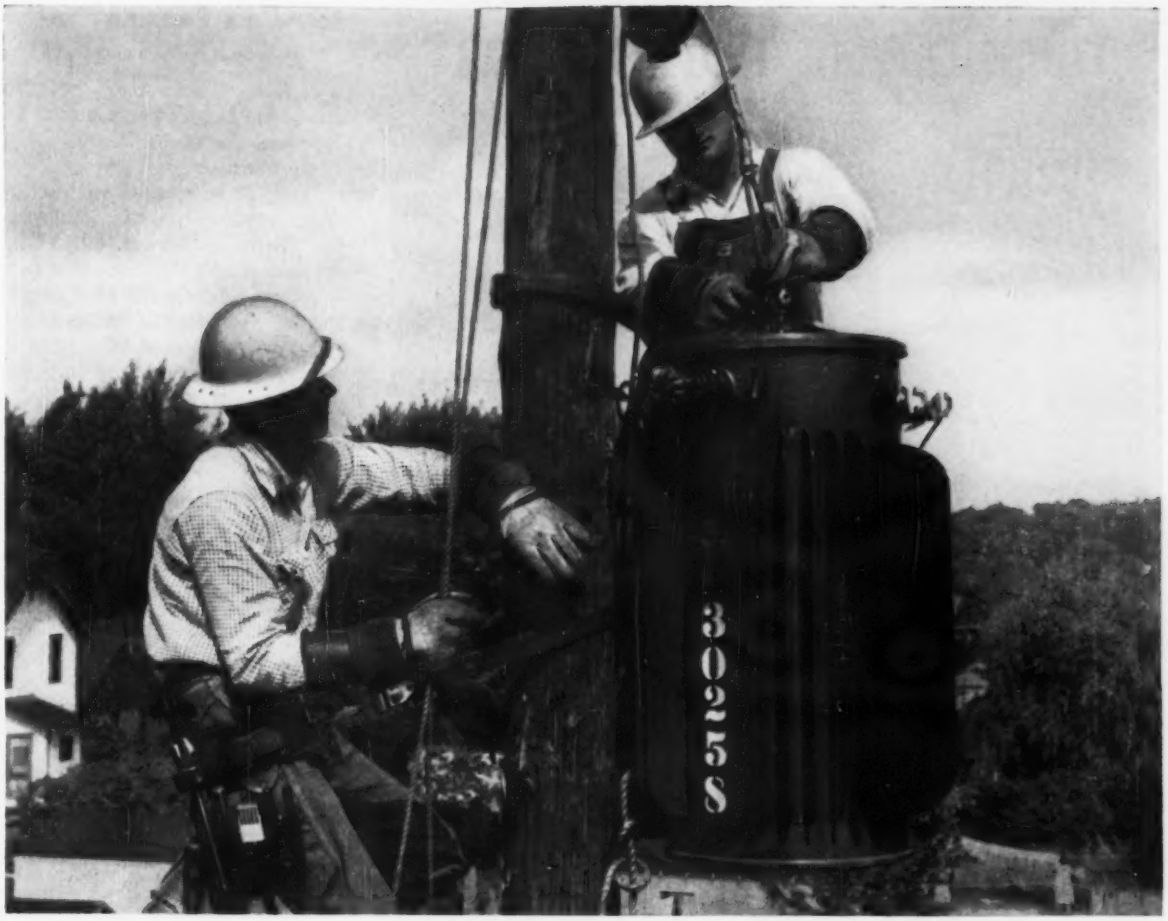
When units, such as diesels, are provided for peaking, the steam units operate at better use factors, and there is a reduction of fuel costs through the application of the heat rate correction factors of Fig 4. The fewer the number of starts and stops the greater the reduction in the wastage of fuel.

When steam units operate in the semi-base or peak zones, application of the heat rate correction factor shown in Fig 4 gives a further reduction in fuel costs. A large steam unit consumes much fuel in bringing the boiler, turbine, and auxiliaries to their operating temperatures. Starting and stopping the unit on a daily schedule wastes much fuel in the process of bringing the equipment up to the proper temperature at each start. This results in rather high heat rate correction factors for annual use factors under 20%. But when diesel units supply the peaks, steam units operate at higher

(*Continued on page* 118)

Annual Cost of Generation—Dollars/Kw of Capacity/Years

Annual Hours' use factor, %	1	2	3	4	7	10	15	25	100
STEAM BASE-LOAD EQUIPMENT									
Fixed cost = 0.17 x $200/kw	$34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00
Heat rate correction factor	3.6	2.65	2.25	2.00	1.63	1.48	1.35	1.25	1.00
Corrected heat rate, BTU/kwhr, based on 9000 BTU/kwhr.	32,400	23,800	20,200	18,000	14,700	13,300	12,200	11,250	9,000
Fuel cost = $9.50/ton, 13,200 BTU/lb	36 cents/1000,000 btu.								
Kwhr gen./kw/yr	87.6	175.2	262.8	350.4	614	876	1,318	2,190	8,760
Fuel cost/kw/yr (kwhr/kw/yr) (Btu/kwhr) 0.36/10^6	$1.04	1.50	1.91	2.28	3.25	4.20	5.78	8.89	28.40
Total annual cost/kw—fixed and fuel	35.04	35.50	35.91	36.28	37.25	38.20	39.78	42.89	62.40
DIESEL GENERATORS: (6,000 kw each)									
Fixed cost: 0.17 x $100/kw	$17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00
Heat rate correction factor	1.05	1.02	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Corrected heat rate, BTU/kwhr based on 11,000 BTU/kwhr	11,600	11,200	11,100	11,000	1,0000	11,000	11,000	11,000	11,000
Fuel cost for distillate oil assumed as 80 cents/1,000,000 BTU									
Kwhr gen/kw/yr	87.6	175.2	262.8	350.4	614	876	1,318	2,190	8,760
Fuel cost/kw/yr	$0.82	1.57	2.34	3.08	5.40	7.71	11.60	19.30	77.10
	$17.82	18.57	19.34	20.08	22.40	24.71	28.60	36.30	94.10



UNIVOLT® 35 TRANSFORMER OIL

Superior Insulation—proved in use!

UNIVOLT 35 is excellent as an insulating and cooling medium. It serves so well because of its high oxidation stability, low power factor, freedom from acid, alkali and corrosive sulfur, and compatibility with the varnish finishes of coils. Its superior heat resistance properties make it particularly effective even under peak loads during the summer due to air conditioning.

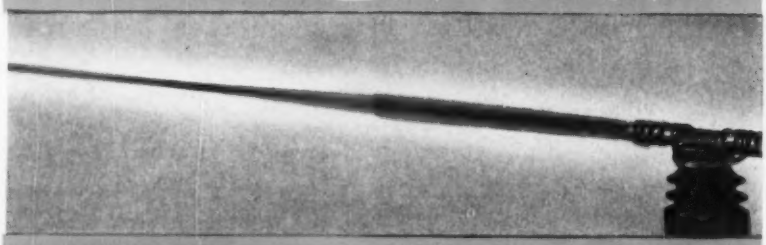
Refined from carefully selected, high quality straight mineral oil, Univolt 35 is shipped to you with utmost care in handling. The tank cars used are specially prepared and inspected, and all loading is done indoors to prevent contamination.

Univolt N 36—a transformer oil possessing all the characteristics of Univolt 35 plus an efficient oxidation inhibitor — is also available.

For complete information on these or any Esso product, contact your nearest Esso office, or write: Esso Standard Oil Company, 15 West 51st Street, New York 19, New York.

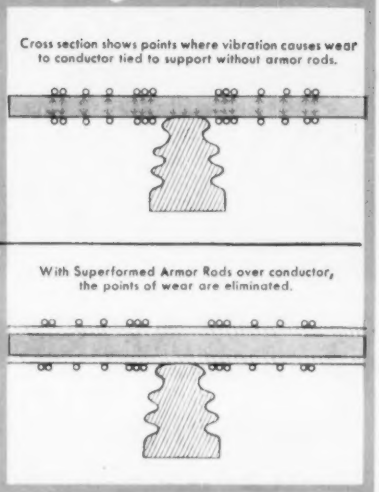
In Industry after Industry..."ESSO RESEARCH works wonders with oil"

TAKING THE PUNISHMENT OF WIND VIBRATION



FANNER Superformed* ARMOR RODS

CUSHION CONDUCTORS against DAMAGE!


Cross section shows points where vibration causes wear to conductor tied to support without armor rods.
With Superformed Armor Rods over conductor, the points of wear are eliminated.

Even at low wind velocities, overhead lines are often subjected to thousands of stress reversals per minute due to aeolian vibration.

With Fanner Superformed Armor Rods installed at points subject to stress and abrasive wear, the conductor receives the best protection against vibration damage as well as electrical burning . . . and many expensive line repairs are eliminated.

Fine FANNER Superformed Products

ARMOR RODS · FANNSPLICES · FANNGRIPS · LINEGUARDS · PATCH RODS · TAP ARMOR · PLASTIC FANNGUARDS · KOVERGARD MOLDINGS

THE FANNER MANUFACTURING CO.
BROOKSIDE PARK CLEVELAND 9, OHIO
Electrical Products Division

*Trademark

Licensed for use under or made in accordance with one or more of the following patents: Patent No. 2,587,521, 2,709,476, 2,588,063 . . . Other patents pending.

Low-Cost Peaking

(*Continued from page* 116)

use factors, and their heat rate correction factors are reduced. This increases the fuel efficiency of the steam machines.

Using an ac network analyzer, the writer studied the effects of peaking units—diesel-generators and medium-pressure-steam generators—on a typical electric utility system for the year 1980. For this study two generation schedules were developed, one with all base-load units operating, the other with 80% of the load supplied by base-load units and 20% of the peaking units operating at various outlying substations. All projected distribution substations were included to round out representation of the future system.

Line Savings Cited

Allotment of about 20% of the generating capacity among various substations had the effect of permitting a system peak of 1,340 Mw to be carried by a transmission system designed to transmit only about 1,070 Mw of base-load capacity.

Accordingly, important savings in the transmission system and transmission substations are possible, especially when the peaking units are allocated to the proper areas so as to obtain maximum prudent postponement of additional major transmission facilities.

Indicated overall savings in capital investment in generation, major transmission, and transmission substations amounts to a worthwhile percentage of the total investment for the 1980 system. Further refinements in the development of the system would undoubtedly show additional capital savings, such as savings through the deferment of circuit reconductoring.

Annual Costs Lessened

Such capital savings bring with them a worthwhile reduction in annual costs.

Such capital savings also bring with them a reduction in annual costs. Thus it can be seen that under certain conditions the use of peak-load generators, such as, diesel-driven units at outlying substations, can effect worthwhile savings in capital investment and in annual costs.

This is only half as good

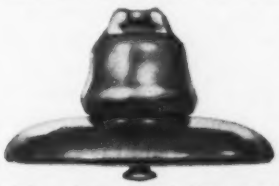
AS THE INSULATORS WE MAKE

. . . but this bisected insulator gives you a look at some of the reasons why the suspensions you buy from Chance do their job so well.

You can see how the shape of the cap and pin wedge against cement which firmly grips sand bands that are "kiln welded" to the porcelain body. You can see the heavy asphalt coating above the porcelain, on the pin, and under the cap which adds to this shock resistance. (It protects against pin corrosion, too.)

There's a lot of quality here which you can't see, however. You can't see the extreme density of the porcelain, or its built-in stability. Only a well-trained lab technician could check the cement, and know that it is of the right consistency, properly cured. Yet, these things do more to determine the quality of an insulator than the things the eye can see.

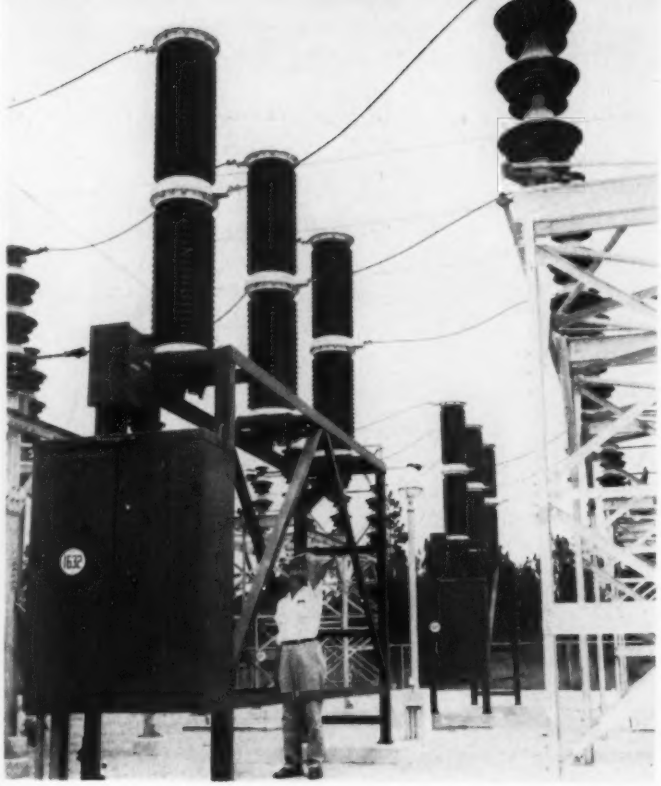
One more, most important, thing you can't see: the strict manufacturing precision and control that makes every Chance suspension an exact copy of the proven master design. Of course, you *could* see this in the plant where Chance insulators are made; it's our way of making sure our insulators will give you years and years of excellent service. We stake our reputation on it.

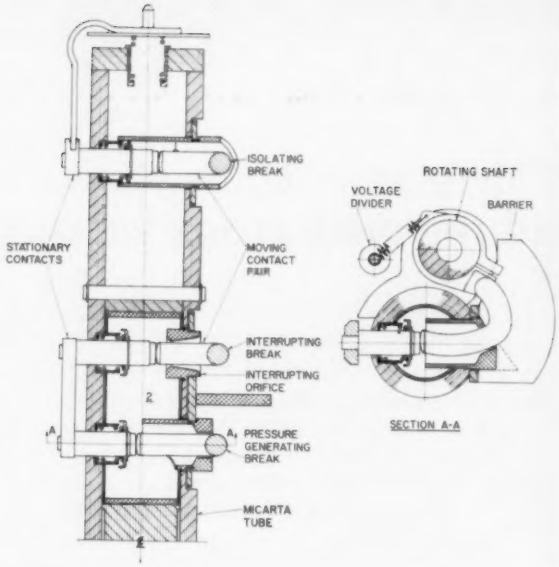


Chance 25,000 pound insulators wear the new NEMA Gray Glaze for easy identification. This is important to your hot-stick crews as you can use easy-to-work ball and socket suspensions without the risk of mixing 25,000 pound with 15,000 pound insulators.

A. B. CHANCE COMPANY CI 59-25

GENERAL OFFICES: CENTRALIA, MO. / A. B. CHANCE CO. OF CANADA, LTD., TORONTO





UPPER THREE BREAKS of contact assembly are shown in the closed position. Stationary contacts are mounted inside an insulating tube lined with an arc-resistant material

UPPER PORCELAIN of pole-unit contains contact assembly; lower porcelain provides insulation between energized parts and ground. Combined chamber contains SF_6 at 45 psig

SF_6 Breakers Pass Service Test

E. B. HENRY, Relay Engineer, Operating Dept, Gulf Power Co, Pensacola, Fla.

F. L. REESE, Power Circuit Breaker Dept, Westinghouse Electric Corp, Trofford, Pa.

Three 115-kv, 1,000-Mva sulfur hexafluoride (SF_6) circuit breakers have been in use on the Gulf Power Co system since 1956. Performance on both capacitance current and short-circuit switching tests has been satisfactory. Other features include:

1. A smaller than normal foundation and supporting structure because there is no breaker demonstration during fault interruption.

2. Use of gas in pole units, preventing high transient currents from damaging the contact assembly. Such currents are prevalent during the closing operation in back-to-back capacitor bank switching.

3. Simple design, requiring minimum adjustment.

4. Elimination of expensive maintenance equipment for filling and emptying pole-units.

Field tests on one of the breakers included 60 3-phase line-charging-current switching tests at 109 kv with interrupted currents of 7 and 16 amp.

Then, 3-phase ungrounded short-circuit switching tests were conducted at 109 kv with the maximum short-circuit available, 460 Mva. All tests were successful, with interrupting times of about three cycles and no breaker demonstration. Examination of an interrupter assembly after the tests showed no noticeable loss of contact material or insulation breakdown.

The field tests confirmed those of a comprehensive program in the Westinghouse High-Power Laboratory.

Interrupted currents ranged from 190 to 6,100 amp rms, which is 110% of the maximum interrupting current rating. Average interrupting time for the tests was three cycles. Additional short-circuit tests with gas pressure 30% below normal operating pressure established the factor of safety.

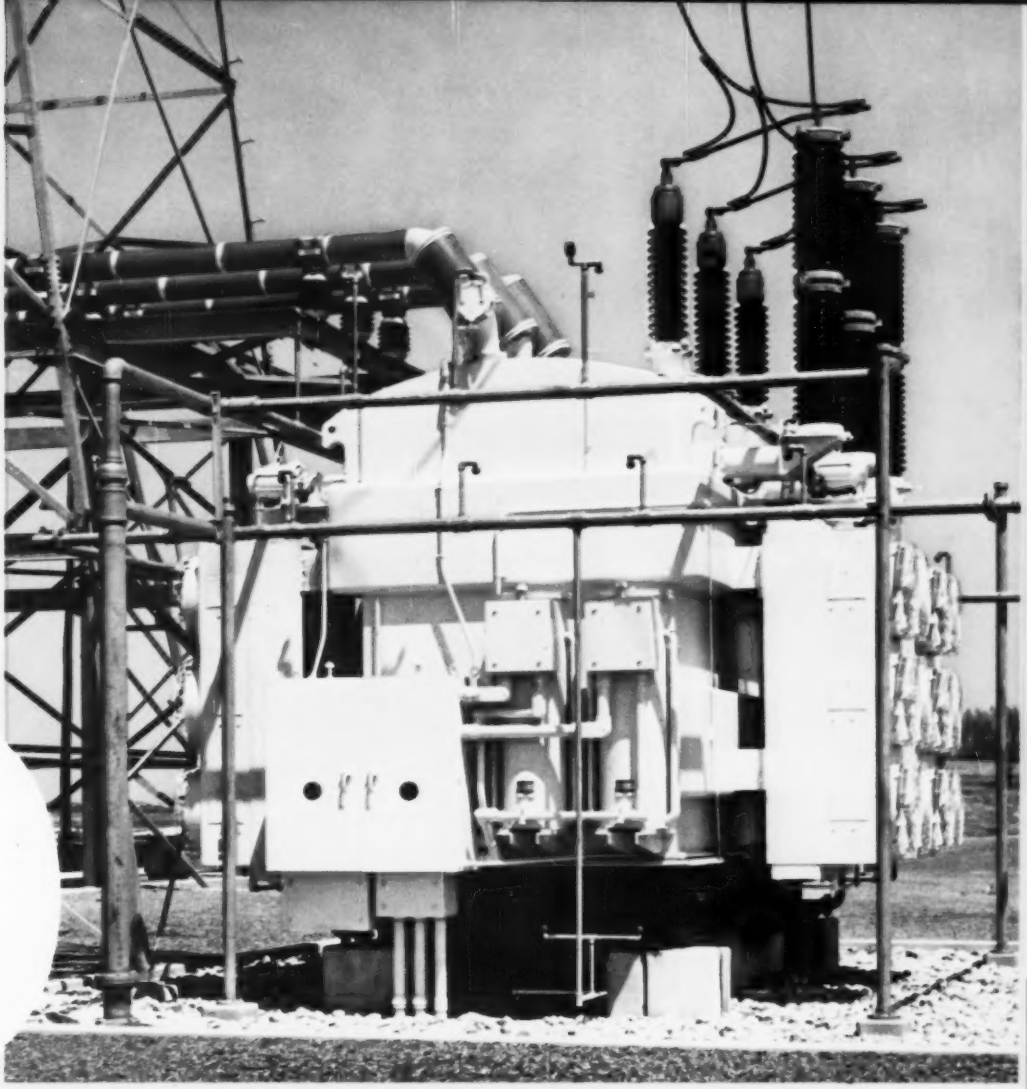
A series of 30 magnetizing and load-current switching tests were made on a single pole-unit at 100 kv. Interrupted currents ranged from 1.2 to 75 amp with maximum interrupting time of three cycles.

In another series, 390 restrike-free capacitance-current switching tests were made switching either a single bank or a multiple capacitor bank back-to-back. Interrupted currents ranged from 16 to 300 amp.

Electrical and mechanical design was verified by successfully passing a momentary test of 8,900 amp, a 4-sec test of 5,900 amp, a temperature rise test of 400 amp, and a life test of 1,700 maintenance-free operations. Finally, 60-cycle voltage withstand tests at 260 kv and voltage tests at 550 kv crest were made.

Since installation in the field there have been two line-to-ground fault clearing operations, both cleared by the breaker being used as a transmission line breaker. The other two breakers have served in a transfer scheme, and there have been three successful transfer operations.

It has not been necessary to refill the pole-units of the transfer breakers since their installation in 1956. The pole-units of the other breaker have not been refilled since the breaker was reinstalled following the field test and inspection of July 1957.



140,000—kva Pennsylvania Power Transformer with additional 10,000-kva reserve capacity. Shell-form, Contour Design. Three phase. Forced-oil, forced-air-cooled. High voltage: 132,000 Grd. Y/76,200 Δ volts. Low voltage: 14,400 Δ volts.

Tailor-made for "BIG D" in the "Lone-Star State"

140,000 KVA PENNSYLVANIA TRANSFORMER HAS RESERVE CAPACITY FOR SERVING THE DALLAS OF TOMORROW

The story of Dallas Power and Light Company is typically Texan, whether told in past, present or future tense. In the few years since 1954, the capacity of the utility has nearly doubled, until it now stands at 956,000 kilowatts. By 1962, another 350,000 kilowatts will have been added.

In light of the utility's rapid growth, it is not surprising that a 140,000-kva Pennsylvania Power Transformer with a "built-in" reserve capacity was chosen for the most recent addition to the system—a 125,000-kilowatt generating unit at Mountain Creek Plant. The transformer is cooled by means of forced-oil-to-air heat exchangers, with four coolers in operation when the transformer is loaded to its normal 140,000-kva capacity. With a fifth cooler, the transformer operates continuously at 150,000 kva.

In keeping with the standard practice made possible by Pennsylvania's shell-form, Contour Design, the transformer was shipped in an upright position with only major accessories removed. As a result, installation time and cost were kept to a minimum.

Pennsylvania has the facilities and the experience needed to provide efficient, economical answers to both "standard" and unusual power transformer requirements. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

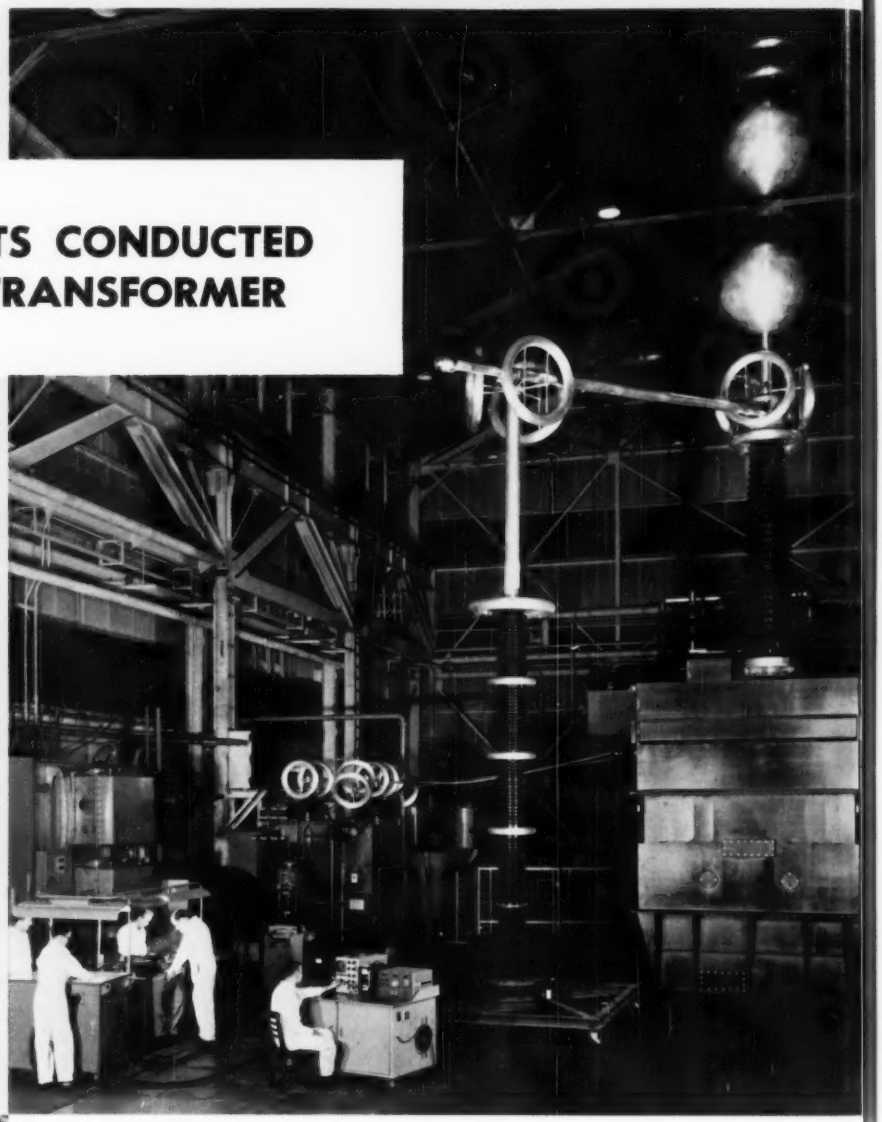
See next page for some facts on facilities . . . . . .

PENNSYLVANIA TRANSFORMERS

McGRAW EDISON

PENNSYLVANIA POWER TRANSFORMERS

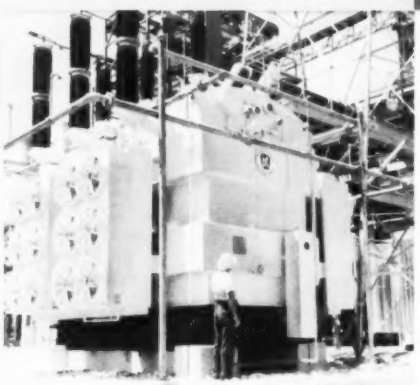
CORONA TESTS CONDUCTED ON 460-KV TRANSFORMER



Highly sensitive equipment recently installed at Pennsylvania Transformer permits the detection of the slightest amount of corona during insulation tests on the transformer. The apparatus serves a double purpose: to check present production, and to help plan the transformers of the future.

The transformer undergoing corona tests in the accompanying photograph is a 460,000-volt prototype of transformers to come, as Pennsylvania prepares to satisfy the demands of utilities for transmission voltages above the present 345,000-volt level.

Shielding on top of the transformer eliminates all electrical discharges into the air, so that the corona level of the internal parts of the transformer may be accurately studied.



Pennsylvania has the facilities and the capability to meet the largest power transformer requirements

- A large, expertly staffed engineering department with long experience in power transformer design—both core form and shell form.
- The ability to design and construct scale models for proving design characteristics.
- A modernly equipped plant capable of producing and testing the highest rated units contemplated by industry today.
- Handling and loading facilities that permit full utilization of manufacturing, shipping and installation economies.

See other side for Pennsylvania Power Transformer installation

McGRAW EDISON

PENNSYLVANIA TRANSFORMER DIVISION

McGRAW-EDISON COMPANY · CANONSBURG, PENNSYLVANIA · GREATER PITTSBURGH DISTRICT

Flicker Curve Expedites Welder Application

G. F. GRONEWOLD, General Engineering Dept, Consumers Power Co, Jackson, Mich.

Consumers Power Co's power systems engineers and power sales engineers have developed a close working relationship to help solve voltage flicker problems caused by resistance welders. The procedure saves time and manpower for both Consumers Power and its industrial customers.

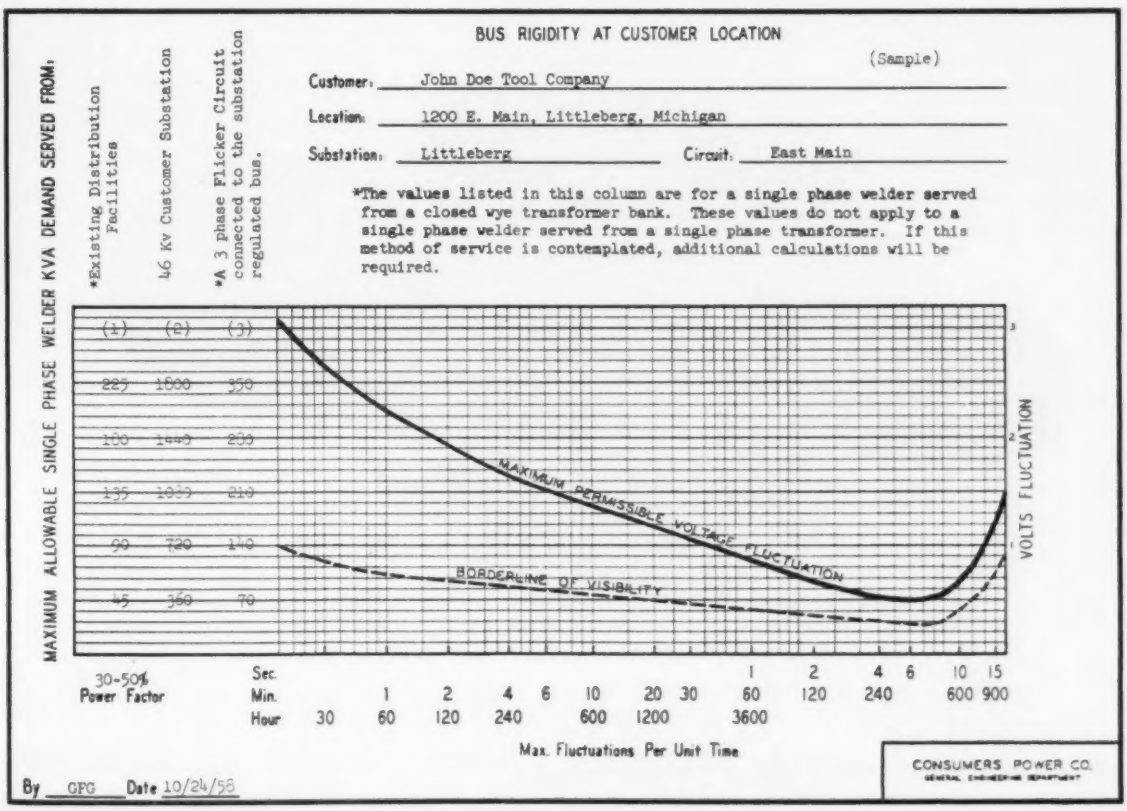
The power sales engineer supplies to the system engineering department information on location and characteristics of a proposed welding load. System engineers then prepare a "Flicker Curve," which reflects system conditions at that point and indicates the "bus rigidity" at the customer's primary bus.

If existing distribution facilities do not appear adequate for the customer's needs, recommendations for other methods of service are included. Column 1 of the scale at the left side of the chart shows bus rigidity with service from existing distribution facilities. The system capability of a transmission substation is shown in Column 2. The third column shows the capability of a "Flicker Circuit" connected to the substation regulated bus.

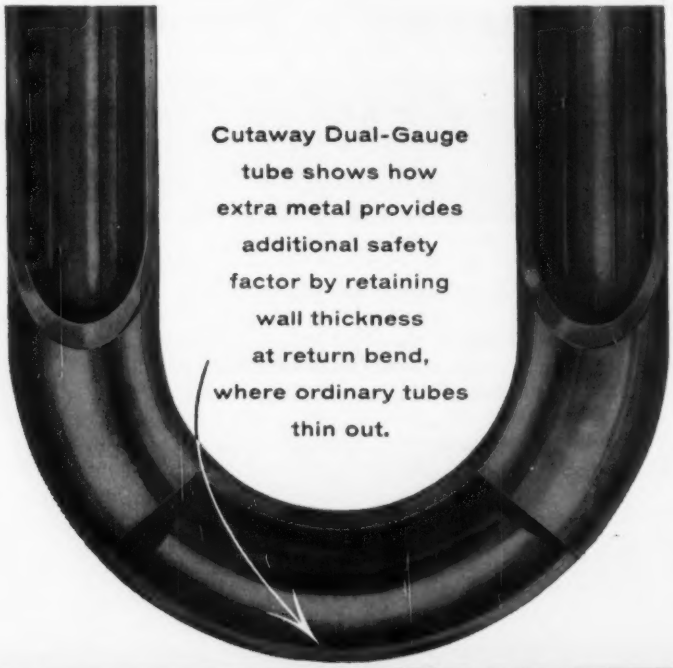
Depending on the case under study, the curve may include allowable demand for a 3-phase welder or for a single-phase welder with power factor correction. Copies of the curve, with engineering recommendations, are supplied to interested Consumers Power Co personnel, including sales engineers.

Thus the power sales engineer can provide the customer with an easily understandable and complete summary of system capability. When appropriate, the customer can furnish copies to a welder manufacturer for his recommendations. When existing distribution facilities do not appear adequate for the customer's needs, the manufacturer is often able to furnish a modified welder which will produce the required weld and stay within system limitations.

The "Flicker Curve" is the Consumers Power Co standard and is similar to the curve shown in the American Institute of Electrical Engineers publication "Power Supply for Resistance Welders."

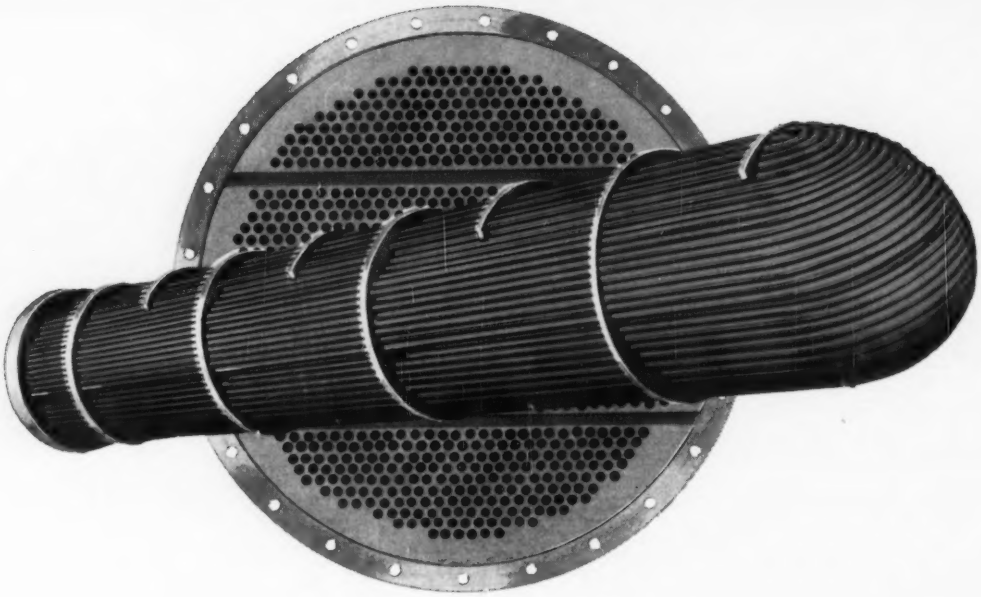

BUS RIGIDITY AT CUSTOMER LOCATION
(Sample)
Customer: John Doe Tool Company
Location: 1200 E. Main, Littleberg, Michigan
Substation: Littleberg
Circuit: East Main
*The values listed in this column are for a single phase welder served from a closed wye transformer bank. These values do not apply to a single phase welder served from a single phase transformer. If this method of service is contemplated, additional calculations will be required.
MAXIMUM ALLOWABLE SINGLE PHASE WELDER KVA DEMAND SERVED FROM:
*Existing Distribution Facilities
46 Kv Customer Substation
*A 3 phase Flicker Circuit connected to the substation regulated bus.
(1) (2) (3)
225 1600 350
180 1440 280
135 1080 210
90 720 140
45 360 70
MAXIMUM PERMISSIBLE VOLTAGE FLUCTUATION
BORDERLINE OF VISIBILITY
VOLTS FLUCTUATION
30-50% Power Factor
Sec.
Min.
Hour
30
1 2 4 6 10 20 30
60 120 240 600 1200 3600
1 2 4 6 10 15
60 120 240 600 900
Max. Fluctuations Per Unit Time
By GFG Date 10/24/58
CONSUMERS POWER CO.

MAXIMUM WELDER KVA that can be served at a given location on the system and resulting flicker voltage are related to frequency of fluctuations. Kva figure on vertical scale is based on short circuit capability for different situations



Specify

DUAL-GAUGE



First for Lasting Quality—from Mine to Market!

To keep tubes uniformly strong
in condensers, feed water heaters,
heat exchangers and similar equipment . . .

PHELPS DODGE

TUBING!

Provides heavier wall thickness:

a. At one or more points in tube length to compensate for thinning on outer portions of return bends.

b. At points of support.

c. At tube ends to meet special requirements.

Produced in all standard sizes or manufactured to the particular design requirements of individual customers.

Available in Cupro-Nickel, Red Brass, Aluminum Brass, Admiralty metal and Muntz metal.

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N. C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

Procurement & Products

OUTLOOK ▶ **Utility purchasing departments will probably be busier than ever** next year despite a slight drop in capital spending budgets. Reason is that distribution construction is slated for a 9.6% rise over this year. The decreases will come in spending for new generation—down 6.6%, and transmission—down 7%.

The tremendous enlargement of utility procurement responsibility over the next fifteen years is dramatized in the final pages of the Forecast Report (pages 111, 112). By 1975, electric utilities will be spending $13.5 billion for new plant alone—some 175% above this year's high of $4.9 billion.

STEEL ▶ **Prices of foreign steel takes upswing** as utilities begin feeling first crimp of steel strike, now past its eighth week. Import prices are now up to or above the U. S. mill price at time strike began.

COPPER ▶ **Copper prices rise in wake of strike in that industry.** One seller, American Metal Climax, which settled at its refinery without a strike, is peddling copper at 33¢ a lb. Rise in foreign demand along with effects of the strike leads Engineering and Mining Journal's weekly market newsletter to predict: ". . . fabricators in the U. S. may have to pay much higher prices by the end of the month.

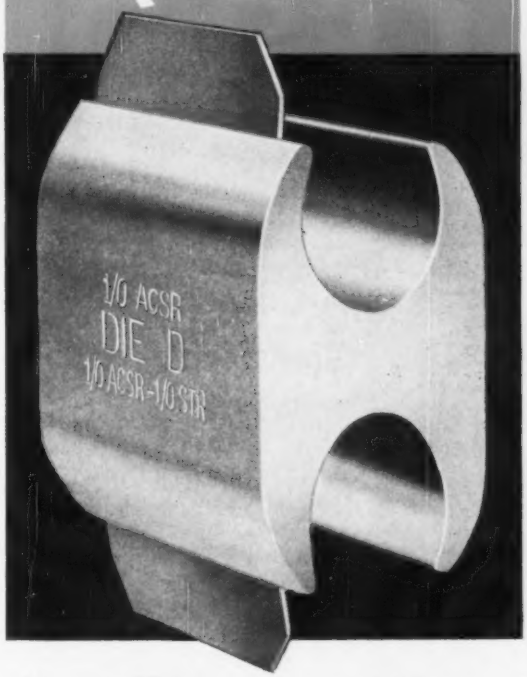
Long-term 30¢ copper price is predicted by metals statistician. William P. Shea, statistician for C. Tennant, Sons & Co, in an article in the current Engineering & Mining Journal writes: "Analysis of the long-term trends in evidence in copper requirements, supplies, and cost of production indicated that during the period 1955-1975, a demand-supply balance could be maintained at an average world price of 30¢ per lb, providing adequate profits for most producers."

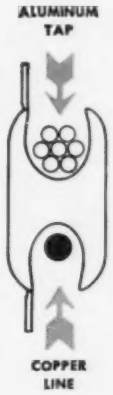
FLY ASH ▶ **Fly ash is a key ingredient** in Long Island Lighting's new parking lot pavement. The new process, which uses fly ash, lime, and water along with the original soil, is said to produce a surface with a density and hardness of poured cement. If the pavement proves successful, LILCO sees wide use of the patented process by the booming Long Island paving industry.

HANDLING ▶ **While orders for materials handling equipment are on the rise,** one large manufacturer reports that the increase is due to such industries as food processing, electrical machinery, and chemical. Orders from utilities, says this manufacturer, are running behind last year.

News of Manufacturers . . . . . page 128
New Equipment . . . . . page 134
Readers Service . . . . . page 144

new! KEARNEY DOUBLE-TAB SQUEEZON





Exclusive Kearney design permits either groove to be used for line or tap. Diagram illustrates Double Tab Squeezon used to make an aluminum "step-up" tap to copper line connection.

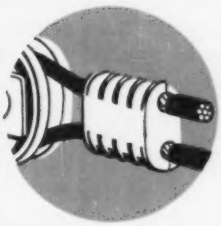
NOW! The Easiest Way to Make Both "Step-Up" and "Step-Down" Tap Connections on All Combinations of Copper, Aluminum and ACSR

The newest, most versatile Squeezon Compression Connector. Dual, fully open groove design, exclusive with Kearney, eliminates need to thread tap conductor through fitting. Use *either* groove for line or tap . . . make "step-up" or "step-down" tap connections quickly and easily. Double Tab Squeezons speed up deadending, too. Form the loop . . . drop the conductors into the open grooves . . . and compress! On insulated wire, remove only a "Squeezon-length" of insulation!

Available in a range of size combinations for aluminum, copper or ACSR. (Write for Selector Card.) Individually packaged in handy "Snap-Open" boxes; grooves factory-filled with Kearnalex inhibitor and contact aid.

REVERSIBLE
The only compression connector with built-in spacer that makes *BOTH* "step-up" and "step-down" tap connections, from copper to ACSR, aluminum to ACSR, or aluminum to copper.

MASSIVE SPACER
Separates conductors . . . eliminates strand cutting . . . and aids in the prevention of galvanic corrosion between dissimilar conductors.



SECONDARY DEADENDING
Faster, easier. No threading through . . . form the loop, position Squeezon and compress! On insulated wire, strip only enough insulation to make the connection.

"SNAP-OPEN" BOX
Individually packaged. Box snaps apart along perforated line . . . INSTANTLY, CLEANLY . . . even with gloves! No stripping, no peeling.

NO DISTORTION
Squeezon groove jaws completely encircle conductor when compressed . . . provide dependable long-line, full circumference contact without distortion or damage to conductor.

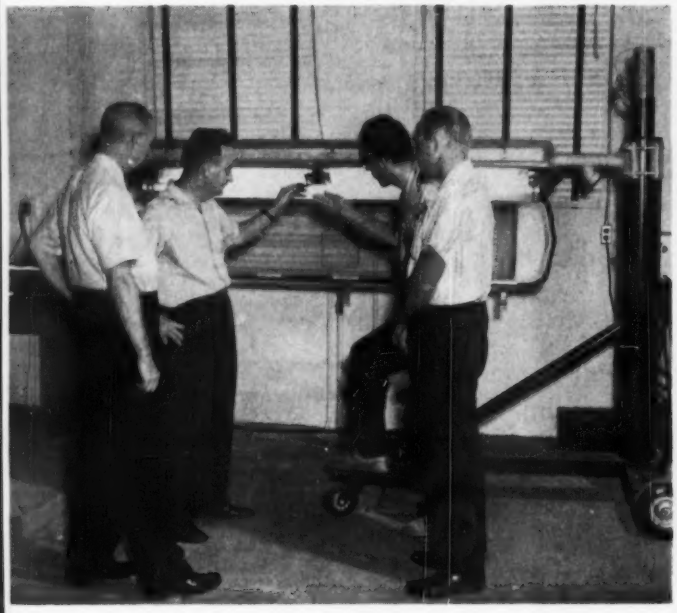
for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA



L-M Develops Brighter Luminaire

A new four-lamp fluorescent luminaire equipped with a Peltier thermo-electric heat pump has been developed by Line Material. L-M says the light output of a typical Peltier-cooled luminaire at 77F ambient temperature is 72% higher than for the same luminaire without a cooling device. Moreover, L-M reports that the light output is almost constant through an ambient temperature range of below zero F to over 77F.

The Peltier device being pointed to in the photo above cools a very small area on the lamp bulb wall. This maintains the mercury vapor pressure within the lamp at the optimum value for maximum light output. Successful field testing of the units has been under way for several months, L-M says. New units will be available as soon as manufacturing facilities are completed.

A-C Reduces Transformer Size

Reductions of as much as 20 to 30% in height and weight of their line of standard small power transformers (5000 kva, 69 kv and below with a 2500-kva unit shown above) have been announced by Allis-Chalmers. A-C says the redesigned line will permit lower foundation, structure, landscaping, and installation costs.

The transformers have been computer pre-engineered to provide the best possible design and shorten delivery time, A-C reports. Special features now available with the new line include: tank bottom sump for sediment collection and complete draining; tap changer at convenient level; grouped accessories; mechanical pressure relief device; base designed for pier mounting; unique easily removable handhole covers.

S & C's New Lab Will Be Electrically Heated

S & C Electric has started work on a $2 million laboratory which to the best of their knowledge will be the first large electrically heated building in Chicago.

Initially, the building will house a 60-Mva short-circuit test generator for research; later a 500 kva generator will be installed for product tests. The 42,000-sq-ft building will have a heliport on top.

Penn-Union Purchases Western Insulated Wire

Penn-Union Electric has purchased Western Insulated Wire Co, of Los Angeles, as part of its expansion program.

According to C. G. Gerlach, president of Penn-Union. Western will continue to operate as a separate subsidiary, retaining its present management personnel, and with no changes in policies or channels of distribution.

Central Vermont P S Orders 20.5-Mw Peaking Gas T-G

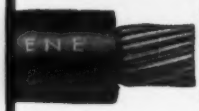
Central Vermont Public Service has placed an order for a 20.5-Mw peaking gas turbine-generator with General Electric. This is GE's third order for the new line of combustion gas turbines which was introduced in March for peaking, after a five-year study of utility power demands was made by the company.

(*Continued on page* 130)

Simplex PRODUCTS GUIDE

SIMPLEX WIRE & CABLE CO., CAMBRIDGE 39, MASSACHUSETTS, U.S.A.

Simplex ANHYDREX Insulated Cables for Power transmission and Communication (like the Simplex TIREX Portable Cords and Cables shown in adjacent column), though manufactured as stock products, are custom designed to suit all service requirements. A large technical and engineering staff at Simplex' main plant is equipped to give you the benefits of their long experience in electrical cable planning.



ANHYDROPRENE — Simplex ANHYDROPRENE Cables are designed for economical installation in ducts, conduits, racks, trays and raceways. Stock sizes AWG 14 to 1000 MCM are recommended for 90 C service in WET or DRY locations. The words "Simplex ANHYDROPRENE" are either printed or molded plainly on the jackets of all ANHYDROPRENE cables. This marking signifies the traditionally high quality of a Simplex product.

CATALOGUE #1028

ANHYDREX-NEOPRENE — Simplex ANHYDREX-NEOPRENE Cables have the added mechanical protection of a heavy wall of neoprene jacketing. These cables are manufactured for use in aerial installations and for direct burial service. Stock sizes AWG 14 to 1000 MCM are recommended for 90 C service in WET or DRY locations.

CATALOGUE #1028

ANHYDREX-PLASTEX — Simplex ANHYDREX-PLASTEX (ANHYDREX-insulated, PLASTEX-jacketed) Cables are scientifically designed for compatibility between insulation and jacket, and for perfectly balanced performance in ducts, conduits, aerial and direct burial installations. ANHYDREX-PLASTEX Cables are recommended for service in a number of environments but especially where oils and chemicals are a problem.

CATALOGUE #1028

ANHYDREX Insulated Control Cables — Simplex ANHYDREX Control, Signal and Communication Cables have an additional thickness of appropriately coded neoprene over each individual conductor, plus heavy-duty neoprene jackets. ANHYDREX insulation provides excellent signal reproduction and is exceptionally stable, even when operating with high ambient temperatures.

CATALOGUE #1028

ANHYDREX XX — Simplex ANHYDREX XX is a butyl-based insulation of the highest possible quality. Because of its exceptional resistance to heat and ozone, it has general applications in circuits operating up to 35,000 volts, with permissible conductor temperatures of 90 C. to 5KV, and 85 C to 17KV — in wet or dry locations.

CATALOGUE #1023

CONDEX — Simplex CONDEX Cables are protected against mechanical damage by interlocked metallic armor. The armor is manufactured of galvanized steel, plain or baked enameled (colored) aluminum, bronze or other metals, and can be applied over any cable core within a very wide diameter range. CONDEX Cables may be further protected by a thermoplastic covering over or under the metallic armor.

CATALOGUE #1024

TIREX SO and SJO Cords — TIREX SO and SJO Cords are constructed to meet the most rigid specifications. All of their special features are carefully selected and processed to give maximum qualifications for portable service. They will twist without kinking, and bend without breaking. TIREX stranding affords maximum flexibility without sacrificing strength.

Conductor temperature rating 75c

CATALOGUE #992

TIREX Low Voltage Portable Cables — TIREX Low Voltage Cables are individually designed for specific applications. They are practically indestructible when used to do the work for which they are intended.

Conductor temperature rating 75c

CATALOGUES #992 & #1011

TIREX High Voltage Portable Cables — TIREX High Voltage Portable Cables have unequaled strength and versatility. Designed primarily to transmit energy to mobile electrical equipment, they are also used as temporary power lines during alterations or emergency repairs.

Conductor temperature rating 75c

CATALOGUE #1012

TIREX Mine Locomotive Cables — TIREX Mine Locomotive Cables — both single and two-conductor concentric — are approved by the Bureau of Mines and have the raised marking "P-101 BM" on their heavy-duty neoprene jackets. All TIREX Cables are cured and conditioned for service in lead.

Conductor temperature rating 75c

CATALOGUE #1011

TIREX Mining Machine and Shuttle Car Cables — TIREX Mining Machine and Shuttle Car Cables are designed for stability under today's rigorous mining conditions. The insulated conductors are "ribbed" or gear-shaped. This feature causes them to interlock with the heavy duty neoprene jacket and prevents them from slipping. Both Type W and Type G have "P-101 BM" molded onto the jacket.

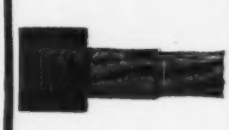
Conductor temperature rating 75c

CATALOGUE #1011

TIREX Dredge and Shovel Cables — TIREX Dredge and Shovel Cables are masterpieces of engineering achievement. Every consideration has been given to safety and durability. Simplex special cured-in-lead neoprene armor effectively resists all the elements normally encountered in this type of work.

Conductor temperature rating 75c

CATALOGUE #1012



TIREX Welding Cables —TIREX Welding Cables are scientifically stranded for maximum flexibility without wrist drag. Cured-in-lead neoprene jackets provide utmost safety for both operator and bystanders.

Conductor temperature rating 75c

CATALOGUE #1011

STOP OUTAGES caused by BIRDS and SQUIRRELS...

with easy-to-apply CHANCE BUSHING COVERS

Birds and squirrels *don't like* Chance Bushing Covers. The tough, durable plastic discourages animal contact, as its unique electrical properties permit a small amount of current leakage to repel these creatures. (Leakage is about 1 milliamp, far below that required to activate breakers or line equipment.)

These covers can be used for vertical or horizontal leads on transformers, regulators, reclosers or other equipment—old or new—to prevent short circuiting by birds and small animals.

They are easy to apply... cover snaps into place... automatically constricts to wrap itself around bushing hardware and jumper wire... is held securely in position by insulated spring. They fit most bushings—accommodate every jumper wire position.

Get years of low-cost protection against bird and squirrel outages by insulating your bushings with Chance Bushing Covers.

A. B. CHANCE CO CENTRALIA, MISSOURI

CC59-21

A. B. Chance Co. of Canada, Ltd., Toronto

Peaking Gas T-G Ordered

(*Continued on page* 133)

The other units ordered will be delivered to Philadelphia Electric and New Orleans Sewerage and Water Board.

The Central Vermont gas turbine will be single-cycle, single-shaft, designed to burn distillate oil. It will drive a 27,059-kva, air-cooled generator. When the outside temperature drops to zero, the gas turbine has a capability of 28 Mw; at 80F it is rated 20.5 Mw.

NEMA Issues New Booklet On Motors and Generators

NEMA's Renewal Parts Section has issued a booklet, "Protective Maintenance of Motors and Generators," which is directed primarily to maintenance men in the electrical industry. It is also of interest to engineering students and those concerned with motor and generator problems. The Standards included in the appendix will assist in obtaining proper products and facilitate maintenance and repair work.

The 63-page booklet furnishes field test material as a ready reference for handling maintenance problems common to electrical rotating machines. Of special interest to maintenance men are four forms in the back: two for motor, generator and control maintenance records and two for motor service records.

Individual copies may be obtained without charge; quantity copies at bulk rates. Address: NEMA Headquarters, 155 East 44 St, N. Y. C. 17.

MANUFACTURERS BRIEFS

Sprague Electric plans to build a $1.6 million research laboratory and office building in North Adams, Mass . . . The first wood preserving plant in our 49th state, Alaska, will be built by **Koppers Co.** The plant, located in Wittier, will be in operation by mid-1960 . . . Two **Westinghouse** marketing organizations have broken ground for new buildings to serve the Baltimore-Wash-

(*More Manufacturers Briefs, p* 133)

lowest
thinnest
trimmest

of all electric baseboard heat!

Arvin

Invisa-Line

with exclusive safety limit thermostats

Here is the most advanced, most thoughtfully engineered and the most wanted of all electric baseboard heat. Thinner, lower, trimmer styling . . . lower, completely safe surface temperature . . . heavy, rod type heating elements for maximum efficiency and long life . . . new, easier methods of installation are all powerful selling features of Arvin Invisa-Line.

Arvin Lo Wattage units are a scant four-and-one-half inches high—a sleek one-and-three-quarters inches thin. Hi Wattage units are scarcely six inches high and two inches thin. Both hug the wall and disappear from conscious view once installed!

Arvin Invisa-Line comes in convenient-to-install pre-wired sections that are easily joined at either end to provide the exact amount of heat needed. Each section, depending on length, contains one or more safety limit thermostats—another Arvin *exclusive* that makes the safest heat even safer.

Take full advantage of the profit potential presented by the strong trend toward electric heat. Offer your customers wonderful new Arvin Invisa-Line Baseboard Heat. It is destined to dominate the field!

Arvin Lo Wattage Section

Arvin Hi Wattage Section

All Arvin Invisa-Line sections are attractively finished in the finest beige enamel, backed on for lasting beauty.

Sections can be painted to match walls or baseboards. Note handsome chrome plated top grille that prevents objects from falling into units and aids in directing warm air flow into room.

In Arvin Invisa-Line, the rod type heating unit is welded to continuous radiating fins and units are mounted on full-floating holders to allow expansion and contraction without popping or cracking. Units are fully guaranteed for five years.

Small, compact, convenient thermostat baseboard sections are available for more economical installations of heat control. These save "wiring in" wall thermostats, a feature your customers will appreciate. Wall thermostats can be used if desired, however.

Arvin

Consumer Products Division

ARVIN INDUSTRIES, INC.

COLUMBUS, INDIANA

Sell a new world of warmth...

Arvin

RADIANT AND FAN FORCED ELECTRIC WALL HEATERS

Your customers will welcome the warm comfort, appreciate the handsome styling and be glad they chose an Arvin no matter which of these fine electric heaters they decide to buy.

And buy they will because of the decided overall superiority of the Arvin line. Instant heat, complete safety, ease of installation, attractive prices are all customer-convincing Arvin advantages that give you a big edge over competition.

Arvin's 27 years of experience and world leadership in portable electric heat is so readily apparent in the entire line that even a casual comparison with others emphasizes the business wisdom of selecting Arvin.

Saleswise, profitwise, the Arvin line will work best for you!

Arvin 100 Series—Instant heat, high styling, complete safety win sales for these sleek, slim-lined radiant bathroom heaters. They're wanted on sight!

Arvin 200 Series—Best of all bathroom heaters. Nichrome® elements produce a wealth of warmth, quiet fan circulates it, thermostat maintains temperature.

Arvin 400 Series-Heavy-duty, for home or office use. Push button controls, Safety Limit Thermostat and warmth-casting reflectors are buy appeals in all models.

Arvin 300 Series—In Summer the husky fan cools, in Winter it provides extra penetration of warmth. Push button controls in all five models.

Arvin also manufactures a complete line of Ceiling Cable with deluxe and standard wall thermostats in both single and double pole.

Arvin

ARVIN INDUSTRIES, INC.
Consumer Products Division
COLUMBUS, INDIANA

Manufacturers Briefs

(*Continued from page* 130)

ington market. One is for the Appliance Sales branch of the parent company, to be located in Savage, Md; the other is for the apparatus and supply division of Westinghouse Electric Supply Co, to be located in Baltimore . . . **General Electric's** new line of coated insulating materials includes bondable silicone rubber tapes. Glass tape insulations are also electrically upgraded so that each type is offered at prices common to the next lower temperature class . . . **Technicon Controls** develops new Auto-Analyzer that analyzes automatically the silica concentration in demineralizer makeup water down to parts per billion.

Manufacturers Literature

To request literature, use code numbers indicated for each item when filling in Reader Service form on page 144.

NETWORK TRANSFORMERS . . . new Vaultmaster design, 300 to 2,500 kva and 5 to 34.5 kv for ac secondary network systems. Unit has new Evans core and winding design, new panel radiators, Melaprene "sandwich" paint finish, new welded low-voltage bushings. Booklet, GEA-5024A, 16 pages. General Electric Co, Schenectady 5, N. Y. G1

DEMAND METERING . . . mechanical demand register and thermal demand metering thoroughly expounded in 54-page brochure, in color with drawings, photos, tables and charts to illustrate phases of operation, accuracy, maintenance, and principles. Special section on questions and answers. Sangamo Electric Co, Springfield, Ill. G2

TELEMETERING . . . supervisory systems, and associated channels, with bibliography arranged chronologically, includes 1600 references by AIEE Telemetering Committee. Booklet, 70 pages, $2.50. AIEE Order Dept, 33 W 9 St, N.Y.C. 18. G3

(*More Procurement & Products p* 134

READ THIS before you specify High Voltage Transmission Clamps or Hardware

BTC HI-LINE HARDWARE CATALOG

Contains valuable reference information, pictures, blueprints and complete specifications on BTC's entire line of DROP-FORGED Steel and Aluminum Hi-Line Hardware.

Send the coupon below . . . this complete BTC Hi-Line Hardware Catalog will be mailed to you without charge.

Pioneers in Drop-Forged Hi-Line Hardware

CLIP AND MAIL THIS COUPON

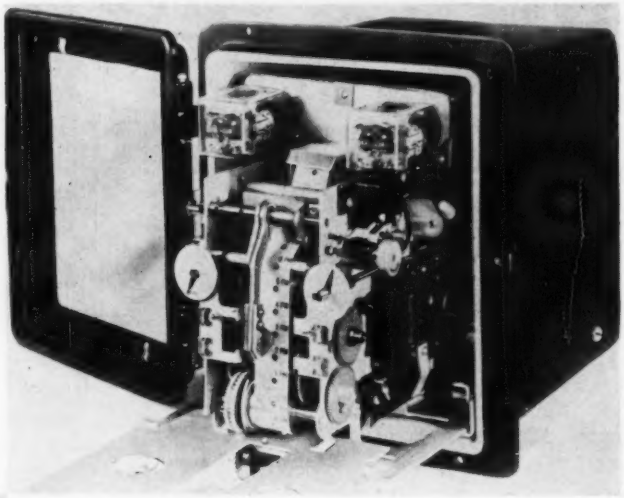
The BREWER-TITCHENER CORPORATION
HI-LINE HARDWARE DIVISION
Cortland, New York

☐ Send complete BTC Hi-Line Hardware Catalog

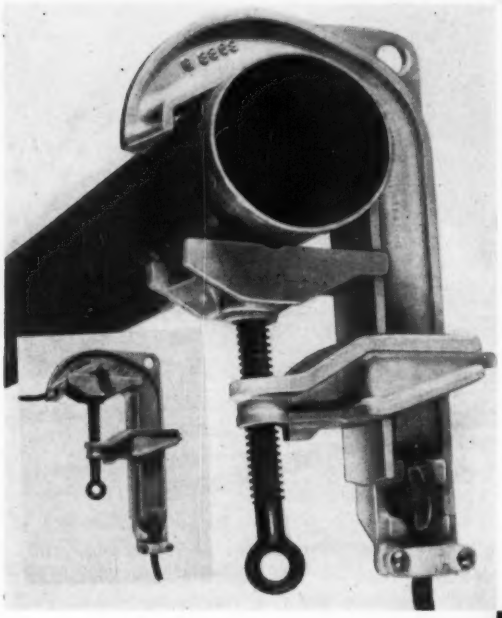
NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ STATE _____

(For further information refer to Reader Service on page 144)

Demand Meters . . .



. . . feature improved printing systems, universal-mounting case with drawout construction, impulse and reset contact assemblies which reduce arcing, and easier tape servicing. For use with a watthour meter or totalizing device, the Types PD-55F and PD-57F provide a printed record of demand. The contact-operated, "block-interval" type meter records demand for each time interval in numbers from 0 to 999.
General Electric Co, Schenectady 5, N. Y.



Bus Grounding Clamp . . .

. . . is designed for temporary grounding connections on large substation buses. Known as No. G3369, it features a main-line conductor range from 1/0 stranded copper to 4x4-in. multiple and square bus and 4 IPS (4.5-in. ID) bus. Tap range is No. 2 to 4/0 insulated jumper cable with ferrule. Though made for heavy-duty service, the clamp is relatively light in weight. The body, lower jaw, and gripper are made of heat-treated aluminum alloy. The eyescrew is bronze.
A. B. Chance Co, Centralia, Mo.

Switchgear . . .

. . . features modular assembly using molded "Pyro-Shield" track-resistant bus bar supports. The 4.16-kv horizontal drawout metal-clad switchgear also has preformed insulated joints. Removable flame-retardant glass polyester caps assure corona-free bus joints; non-magnetic aluminum base plates used to mount current transformers reduce heating from magnetism.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

(*More New Equipment on page* 136)

experience

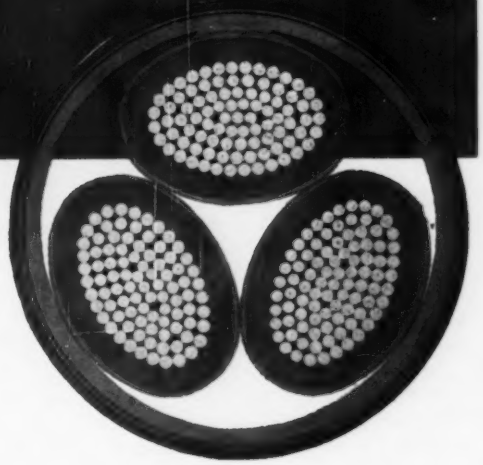
keeps BICC *in the lead*

134 countries can't be wrong —

Last year the BICC Group traded in 134 countries. We supplied cables, conductors and accessories for every electrical purpose, and sales amounted to $310,800,000. Why such a demand? Well, we're not only the World's biggest cablemakers; we're the most experienced too. Here are some of our recent developments.

The DSO cable

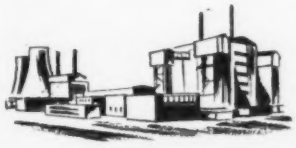
—designed for economy



The Ductless Shaped-conductor Oil-filled cable is BICC's latest development in 33kV transmission. Dispensing with fillers and built-in ducts, the design means economy in materials and manufacture. Consequently, costs are lower. The advantages of D.S.O. Cables were quickly recognised. They have already been ordered for a number of installations in Britain and South Africa.

CABLES FOR THE FIRST NUCLEAR POWER STATION

BICC supplied cables and accessories for Calder Hall, England, the first nuclear power station in commercial operation. The cables included specially designed types resistant to intense radiation and heat, for operating the fuel charging and discharging grabs.



VANCOUVER POWER LINK

The 138kV Submarine Power Link between the British Columbia mainland and Vancouver Island required seven unjointed cables each 16 miles in length: the longest unjointed power cables ever! Although this project was considered to be impossible by the electrical world, BICC designed, made and laid the cables with conspicuous success. Altogether, $10 million worth of power cable contracts have been placed with BICC by the British Columbia Electric Co., Ltd.

330,000 VOLT CABLE FOR KARIBA

The Kariba Dam is being built on the Zambesi River to provide hydro-electric power for Central Africa.

Transmission equipment for this project is being manufactured by BICC. Altogether, orders for this Company total some ten million dollars and include a specially designed 330,000 volt single-conductor oil-filled cable which will connect the underground power house to the overhead transmission lines. This will be the highest voltage cable ever installed in Africa.

BICC the World's largest cablemakers

BRITISH INSULATED CALLENDER'S CABLES LIMITED

Technical Representative in U.S.A., Arthur F. Coventry, 11 West 42nd Street, Suite 442, New York 36, N.Y.

Installed for 25 years of control service

Installation of 60-PCL-23 C&D PlastiCal® Control Battery at new 75,000 kw Harbor Station, United Illuminating Co., Bridgeport, Conn.

United Illuminating Co. uses C & D PlastiCal® batteries for the critical job of control

By any check—capacity, convenience, economy, life—C & D PlastiCal® batteries can't be matched, when it comes to supplying instantaneous, dependable power for critical control applications.

Here at the new Harbor Station of The United Illuminating Co., Bridgeport, Conn., C & D PlastiCal control batteries have four important jobs:

1. operating control relays, pilot lights, and signals on the control board;
2. providing d-c emergency lighting;
3. closing and tripping circuit breakers;
4. emergency operation of bearing oil pumps, and main steam valves.

PlastiCal takes these important assignments in stride. Specifically engineered for control duty, this advanced-design lead-calcium plate battery has the high capacity necessary to sustain full load, when required.

PlastiCal works five times as long as conventional batteries without need for water—requires less charging current. And, PlastiCal has a life expectancy of 25 years in full-float operation.

More and more utilities are realizing the value of C & D PlastiCal batteries in control service. Ask your C & D representative for full details, or—

Send for Bulletin CP-540.

C&D

Since 1906

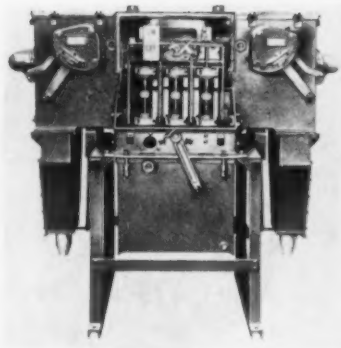
C&D BATTERIES, INC.

of Conshohocken, Pa. ... Attica, Ind.

Sales and Service Offices in Principal Cities from Coast to Coast

Manufacturers of Ayer-Hat® Industrial Batteries • Kathanode and Kathabar® Batteries for Communications, Control and Auxiliary Power • Producers of Analy* Silicon Chargers.

*Trademark



Load Break Switch . . .

. . . is designed to prevent single-phasing of the protected equipment. The 15-kv, 3-phase, outdoor-type unit has an interrupting capacity of 250 Mva at 13.8 kv. Current limiting fuses used have striker pins. When a fuse in any one phase is blown, the associated striker pin trips the 3-phase load breaking switch to prevent single-phasing. The switch, manufactured by J. G. Satter and Co, Ltd, London, England, has a BIL of 150 kv and can be used for all operating voltages between 2.4 and 13.8 kv. **Electro-Machinery Corp, 50 Broad St, New York 4, N. Y.**

Fire Extinguishers . . .

. . . in a new line allow the flow of dry chemical to be controlled and directed with one hand. The operating lever in models of the Sentry "Energized" series locks down for activation so the discharge can be aimed and controlled with a shut-off nozzle on the hose. Extinguishers are available in 10, 20 and 30-lb dry chemical capacities. **Ansul Chemical Co, Marinette, Wis.**

(More New Equipment on page 138)

Sub-Station Man's Best Friend... VICTOR Apparatus Insulators

No. 729 (EEI-NEMA 58-7) Apparatus Insulator

When power demands require switching . . . when rain, snow or sleet increase danger of current leakage and flashover, the sub-station super can feel a lot more comfortable if VICTOR Switch and Bus Insulators are standard on his installation.

Their design has been proven in thousands of installations. The most rigid quality control gives the power man insulators of absolute uniformity. Conscientious testing procedures with the industry's most modern testing equipment assure exceptional reliability under the most extreme conditions.

VICTOR stacking units, such as the No. 729 shown above, have been proved by some of the nation's foremost utilities to be able to undergo more severe service over a longer period than any other switch insulators on the market today!

NOT A THING TO WORRY ABOUT

No matter what your particular conditions of service, you can be sure that VICTOR units will take all you can give them . . . and more, thanks to VICTOR's quality control testing program. Take cantilever strength for example. Apparatus insulators are continually taken from the production lines and tested to destruction in the VICTOR Mechanical and Electrical Laboratory. Incidentally, the cantilever strength ratings given VICTOR apparatus insulators in our catalog are EEI-NEMA minimums. Actual test data shows that they withstand as much as twice these ratings before failing.

WE REALLY WORK 'EM OVER!

Every individual VICTOR apparatus insulator is gauged for correct alignment and positioning of bolt holes, and given a routine tensile or "pull" test just prior to final electrical tests. High voltage testing equipment, designed and made by VICTOR, permits continuous high frequency and 60-cycle flashover testing of apparatus insulators to assure individual conformance to VICTOR's high standards.

PURITY IS HERE TO STAY!

Purified Porcelain has *proved* itself superior to any insulator porcelain ever made. Here are some of the more important advantages you get when you buy VICTOR: • Improved thermal resistance. *Purified* Porcelain expands and contracts more uniformly during sudden temperature changes • Unmatched hardness and density resulting in rock-like strength • Better torsion, tension, cantilever and impact values • Smoother, harder glaze with unequalled self-cleaning characteristics • Uniformity of product never before achieved.

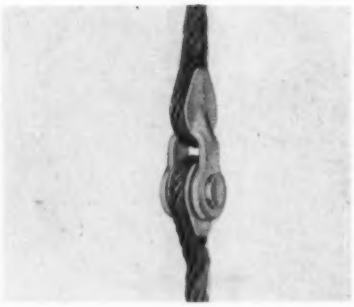
CAST IRON "CORSET"

Ladies used to use 'em to hold themselves in attractive alignment. We use 'em to hold caps, shells and pins of our apparatus insulators in perfect alignment. By using an individual *tempered cast iron jig* for each individual insulator, all shells, caps, pin and bolt holes seat perfectly; are accurately aligned. Rows of these insulators, each in its own "corset," are continually in process at our plant.

For full information on VICTOR Apparatus Insulators, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, N.Y.

I-T-E CIRCUIT BREAKER COMPANY

VICTOR INSULATORS DIVISION

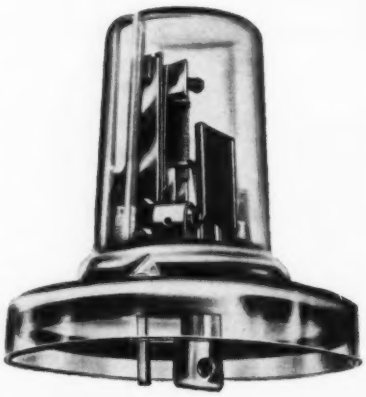


Boom Pendant . . .

. . . fitting for wire rope is one-piece drop forged steel. The fitting is stronger than the wire rope with which it is used. It is interchangeable with standard wire rope sockets.
Sherman & Reilly, Inc, First and Broad Sts, Chattanooga 2, Tenn.

Dielectric Tester . . .

. . . tests cables at voltages up to 60,000 v dc and automatically supplies tracer current to a faulted cable. Called the Model 2146 Combination Dielectric Tester and Tracer Set, the unit can provide peak power pulses of up to 80 kw for tracing. When a fault occurs, the tracing-current section of the test set is automatically switched in.
Sorensen & Co, South Norwalk, Conn.

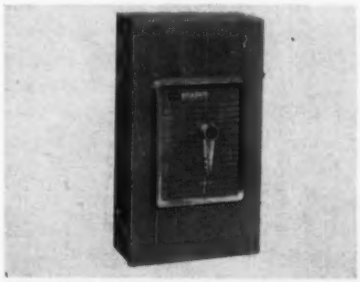


Lighting Control . . .

. . . in either 120 or 240-v models is assembled in a transparent weather-proof gasketed housing of Tenite No. 2, which does not discolor, crack or craze. The D-2-275 control has a polarized twist lock and built-in lightning arrester. The tubeless unit has an SPST normally-closed integrating relay operated by a wide-area CdS photo cell.
Precision Magnetic Controls, Inc, Ridgewood, N. J.

Safety Switches . . .

. . . rated from 400 through 1,200 amp incorporate the quick-make, quick-break principle. The QMQB switches have an interrupting capacity of 100,000 amp when current



WHY G-E UNIT-CONSTRUCTED ARRESTERS ARE THE KEY TO REAL DOLLAR SAVINGS

by E. J. ALLEN, General Electric's Supervisor of Station Equipment Sales

Substantial savings can be realized by the elimination of "complete arrester" inventories. And only unit-constructed arresters make these savings possible. Utilities who stock spare "complete arrester" poles of several ratings can reduce their inventories by stocking only appropriate ratings of the unit-constructed General Electric station-class arrester.

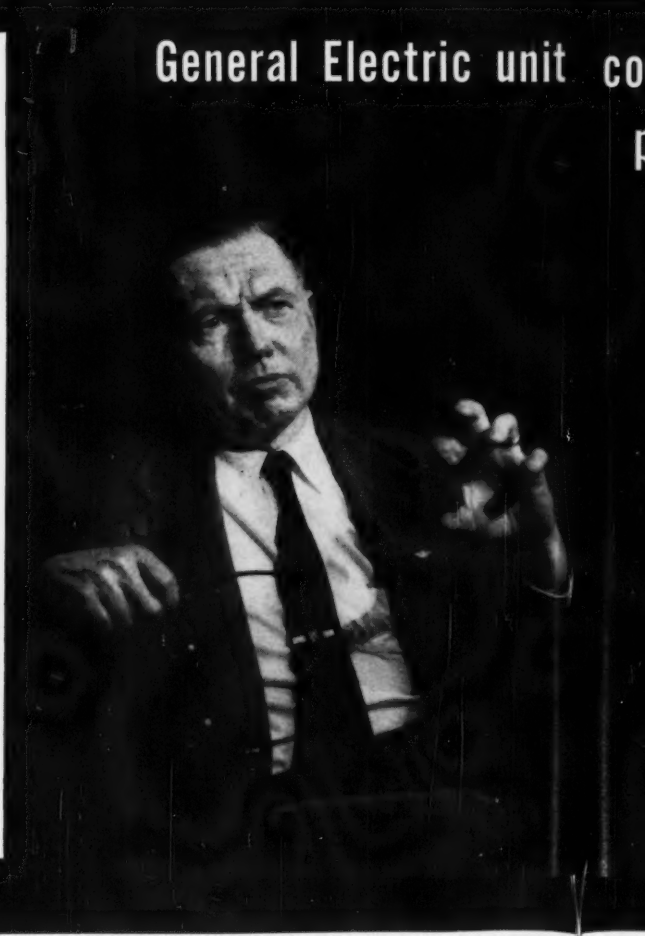
THREE BASIC UNITS of the Form 3K arrester, available from factory and district stocks, provide all necessary "building blocks." These single, easily-handled units can be readily added or removed to change arrester ratings. For example, when increasing a 138-kv grounded neutral system—using an "80 percent" 121-kv arrester—to a 230-kv grounded neutral system—using a "75 percent" 182-kv arrester—you need add only one 60-kv Form 3K arrester unit and grading ring.

ONLY THE G-E MAGNE-VALVE station-class arrester combines the advantage of rugged unit construction and built-in anti-contamination feature with service-proved Magne-valve electromagnetic principle of arc interruption. And, of course, modern Thyrite* station-class arresters can be "hot-washed" with hose or spray systems.

For complete details contact your G-E Representative or write Section 435-20, General Electric Company, Schenectady, N. Y.

*Reg. Trademark of the General Electric Company.

GENERAL ELECTRIC



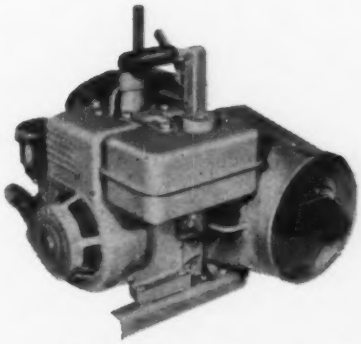
limiting fuses are inserted. They are manually operated circuit interrupters employing a circuit breaker type operating mechanism in conjunction with fuses.
Federal Pacific Electric Co, 50 Paris St, Newark 1, N. J.

Silicon Rectifiers . . .

. . . in two new 250-v lines are now available. One is for heavy-duty steel mill and industrial applications and the other for general purpose applications. The units are offered in 400, 500, 600, 750, 1,000, 1,500 and 2,000-kw ratings with standard sizes carrying 100% continuous loads, 125% current loads for two hours, or 200% for 1 min.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Portable Blower . . .

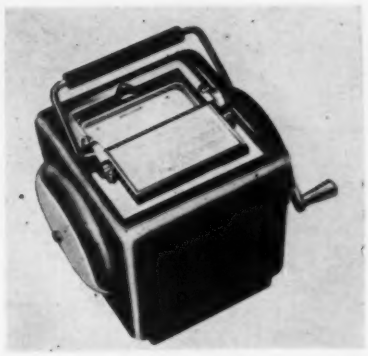
. . . for supplying fresh air to manholes has a rated capacity of 800 cu ft of air per min. A motor driven



model operates from either ac or dc at 115 v, and an engine driven model includes a provision for two governed speeds and an adjustable discharge damper.
United States Motors Corp, Oshkosh, Wis.

Electronic Indicator . . .

. . . can, with accessories, indicate flow, liquid level, temperature, pressure, position, input motion, $\%O_2$, $\%CO_2$, $\%H_2$, pH, resistance and dc millivolts. Styled Model 721 Electronic Indicator, either of two electronic receiver units can be incorporated with suitable transmitters—a differential transformer receiver or a slidewire receiver.
The Hays Corp, Michigan City, Ind.



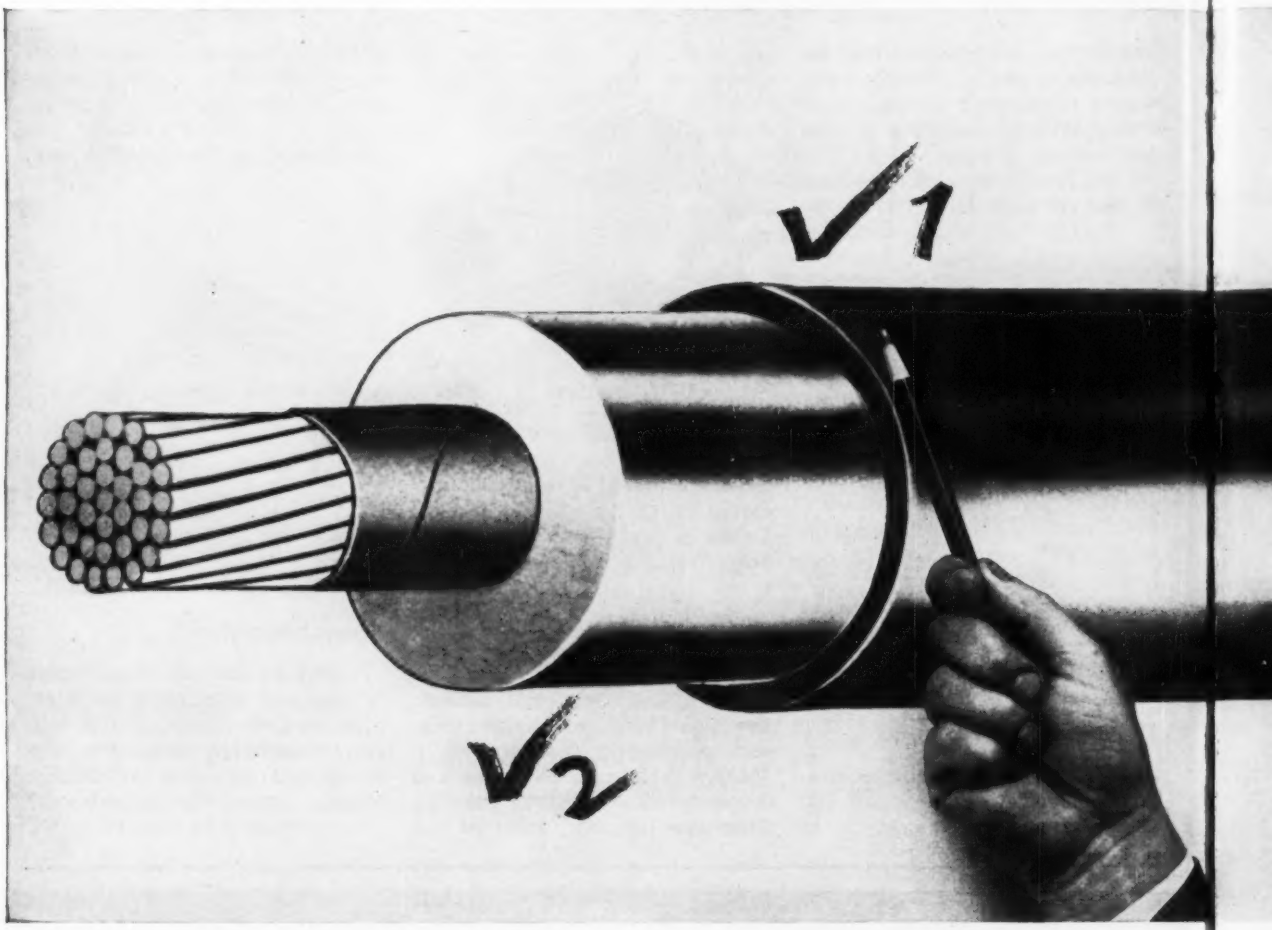
Megohmmeter . . .

. . . provides new ease of operation. A generator with 39-bar armature produces lower ripple in output voltage. Neon lamps are used to illuminate the meter dial and stabilize output against "leakage bursts"
(*Continued on page* 142)

t construction of station-class lightning arresters provides economical and versatile protection

Basic building units of the General Electric Form 3K station-class lightning arresters. These units are stacked to provide a variety of ratings for high- and extra-high-voltage circuits, 69-kv to 460-kv, as shown with 182-kv arrester on right for 230-kv Grounded Y system. This is but one of 15 standard ratings constructed from basic units.

GENERAL ELECTRIC



Check these superior
GENERAL ELECTRIC SUPER

✓ 1. Flamenol* jacket:

—excellent dielectric properties.
—resistance to oils, acids, alkalis, flame, sunlight, and moisture.
—resistance to abrasion and corona cutting.
—moisture absorption equal to or better than good moisture-resistant rubber insulations.
—permanent color coding for easy circuit identification.
—easy pulling in ducts and conduits.

✓ 2. Super Coronol* insulation:

—uniformity of insulation on high-voltage cables is controlled by unique method of vulcanizing vertically downward.
—centering of conductor in the insulation checked by means of X-ray readings.
—ozone and heat resistance.
—sunlight and moisture resistance.
—excellent current-carrying capacity 90 C up to 5000 volts, 85 C from 5001 volts up to 15,000 volts.
—ability to withstand severe overloading.

Progress Is Our Most Important Product

GENERAL ELECTRIC

features built into
CORONOL FLAMENOL CABLE

These features make General Electric Super Coronol Flamenol cables ideal for economical, dependable use in conduit, open air, racks or trays, and for direct burial in both wet and dry locations. Comparable special benefits are built into all General Electric wire and cable—the result of the wide scope of General Electric's laboratory research and General Electric's long years of design and manufacturing experience in the wire and cable field.

**Registered trade-mark General Electric Company.*

For further information on G-E Super Coronol Flamenol cable, mail the handy coupon.

General Electric Company
Wire and Cable Department
Section W227-927
Bridgeport 2, Conn.

Please send me your booklet on G-E Super Coronol Flamenol Cables.

Name _____

Title _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

New Kidde carbon dioxide portables awarded highest U.L. rating!

Belleville, N. J. — A spokesman for Walter Kidde & Company announced here today that four of the company's new portable fire extinguishers have been awarded the Underwriters' Laboratories highest ratings for their respective capacities. To those interested in fire safety, this means that, pound for pound, these new Kidde units have more fire-killing power than any other carbon dioxide extinguishers on the market today.

Available in 15 and 20 pound capacities, in either squeeze valve or trigger models, these power-packed Kidde units feature new hose and discharge horn assemblies, which are responsible for their extra fire fighting ability. The new assembly is supplied also with Kidde's 10 pound carbon dioxide portable which has a U. L. rating not exceeded by any other extinguisher of its capacity. This hose-horn combination is also being offered as a replacement unit for existing 10, 15 and 20 pound carbon dioxide units, and when attached will upgrade their effectiveness equal to the new ratings.

For more information on these top-rated Kidde carbon dioxide portables write Kidde today.

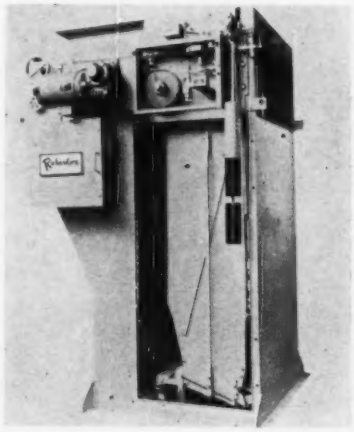
Kidde

Industrial and Marine Division
Walter Kidde & Company, Inc.
930 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal — Toronto — Vancouver

Megohmmeter . . .

(*Continued from page* 139)

such as occur on moisture-laden insulation. It is known as the Model 5G1000 Series B MEGΩMETER.
Winslow Co, 701 Lehigh Ave, Union, N. J.



Coal Scale . . .

. . . with 1,000-lb unit capacity can handle 60 tons an hour. Eight access doors provide accessibility to all critical parts. A mechanical counter, directly linked to the operating levers, registers the number of discharges made by the scale.
Richardson Scale Co, Clifton, N. J.

Probe . . .

. . . can measure total pressure, static pressure, yaw angle and pitch angle when inserted through a ⅛-in. diameter hole. The Three-Dimensional Velocity Measuring Probe investigates flow conditions inside fluid flow machinery such as turbines, compressors and burners. A variation contains a thermocouple in addition to the pressure measurements and has a minimum diameter of 3/16 in.
United Sensor & Control Corp, Box 127, Glastonbury, Conn.

Cable Tray . . .

. . . for support of power and control cables permits dropping cables out at any point in the run. The

(*Continued on page* 148)

. . . made more useful

by MACALLEN

Unfailing stability at high operating temperatures is often the key requirement of MACALLEN Mica . . . in products ranging from toasters to diesel-electric locomotives. With MACALLEN Mica this vital insulating property can be applied in the widest range of shapes and sizes . . . with the greatest efficiency and economy. Solve *your* insulation problem with MACALLEN Mica . . . choice of the electrical industry since 1892. Send for free Catalog 25 today.

MACALLEN MICA

• ALL FORMS • ALL QUANTITIES
• ALL DEPENDABLE

THE MACALLEN COMPANY, INC.

Bay Road, Newmarket, New Hampshire

CHICAGO: 565 W. Washington Blvd.
CLEVELAND: 1231 Superior Ave.

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

GE ..... Meter ☐
Chance ..... Clamp ☐
Allis-Chalmers ..... Switchgear ☐
Electro-Machinery ..... Switch ☐
Ansul ..... Fire Extinguishers ☐
Sherman & Reilly ..... Pendant ☐
Sorensen ..... Tester ☐
Precision Magnetic ..... Control ☐
Federal Pacific ..... Switches ☐
Allis-Chalmers ..... Rectifiers ☐
US Motors ..... Blower ☐
Hays ..... Indicator ☐
Winslow ..... Megohmmeter ☐
Richardson ..... Scale ☐
United Sensor ..... Probe ☐
P-W ..... Cable Tray ☐

MANUFACTURERS LITERATURE

Code No. .....

(Requests are made from code numbers on page 133).

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* **Note: Requests must be received within four weeks of publication date, accompanied by complete information, specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.**

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SEPTEMBER 14, 1959

Crapo GALVANIZED STEEL STRAND

TENSILE STRENGTH TESTS*

...assure high, dependable quality and long service!

When you specify a size and grade of CRAPO Galvanized Steel Strand you can be sure that it will meet or exceed the required standards. The wire used in its manufacture is laboratory-tested in process, and before stranding, for tensile strength, ductility, elongation, gauge, and the quality and weight of the zinc coating. After stranding the finished product is rechecked by the laboratory for tensile strength, lay, wire diameter, ductility and galvanizing.

This continuous testing is but one of the reasons why CRAPO galvanized steel strand enjoys a reputation second to none for long life and dependable performance. More than 50 years of specialized skill and experience in producing quality strand for the power and communication industries are your further assurance of its all 'round reliability.

Send for this New FREE Booklet

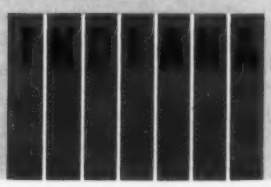
"The Story Behind CRAPO Galvanized Wire and Strand" illustrating and describing manufacturing and testing techniques. Ask for Booklet B-59!

* One of the series of Laboratory Tests to insure a better product

AVAILABLE IN 3 COATINGS

For Guys, Messenger and Overhead Ground Wire

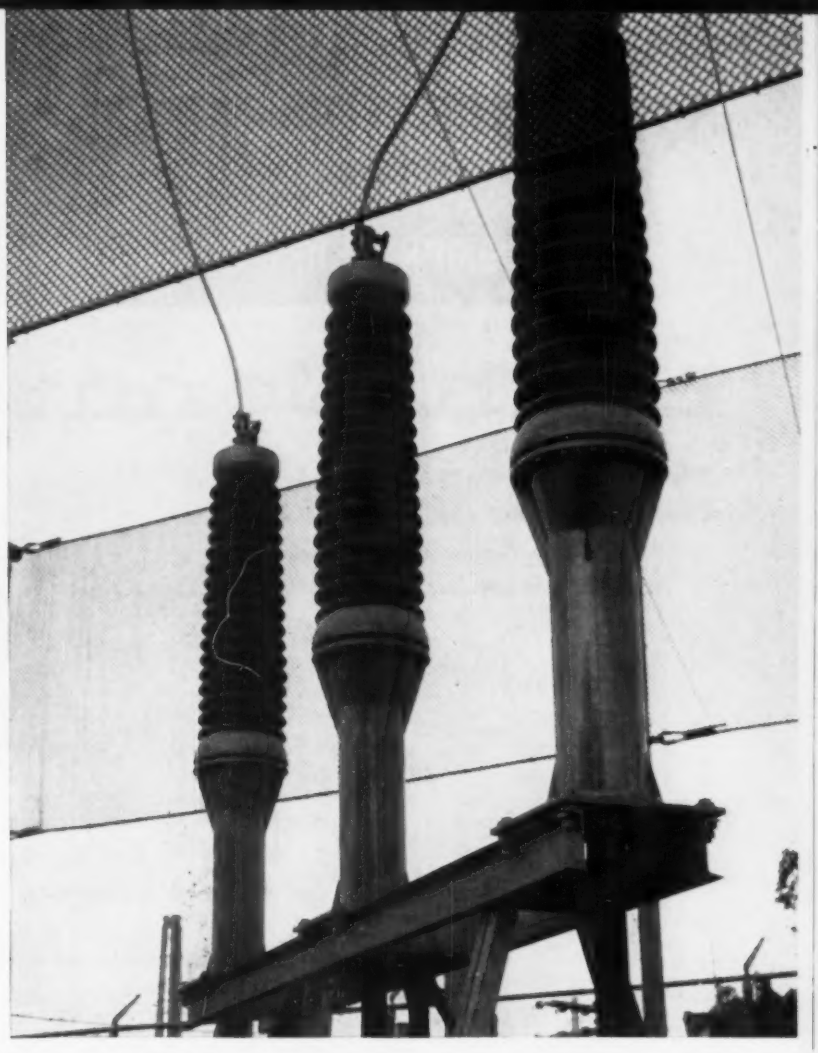
All sizes and grades of CRAPO Galvanized Steel Strand are available in A, B and C coatings. Class B coating is twice as thick as Class A coating; Class C is three times as thick as Class A.



STEEL & WIRE CO., INC.
Muncie, Indiana

ANOTHER FIRST from G&W

"a significant step forward in the termination of high-voltage cable"*



The first use of a commercially available

138 kv HIGH PRESSURE ALL-GAS POTHEAD

in which the porcelain is subjected to full line pressure

The very first pothead to be used commercially was designed by the founders of G&W. Over fifty-five years later and many other "firsts," G&W engineers have produced the most complete line of potheads available to industry. You can specify the pothead of your choice with utmost confidence.

G&W experience, engineering skill, and the manufacturing resources at its command are second to none. They are your positive guarantee of satisfaction.

Write today for your copy of "MORE POWER DOWNTOWN".

* *This quote is from an authoritative article titled, "More Power Downtown". The article gives full facts on new ideas used in the construction of a 110 kv underground system on the West Coast. Describes techniques you'll want to know about—"must" reading. Send for your copy today.*

G&W ELECTRIC SPECIALTY CO.

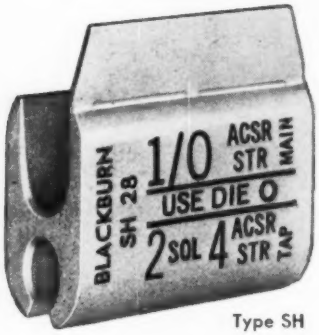
3500 W. 127th Street • Blue Island • Illinois

Canadian Mfr. —Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

ENGINEERED INTO BLACKBURN'S COMPRESSION CONNECTORS

High Conductivity-

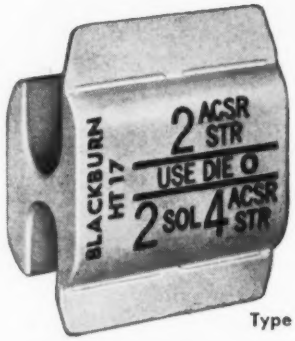
Blackburn has engineered all compression connectors shown to fit your present tooling program—and added advantages to meet engineers' and linemen's requirements.



Type SH

Type HT Prefilled

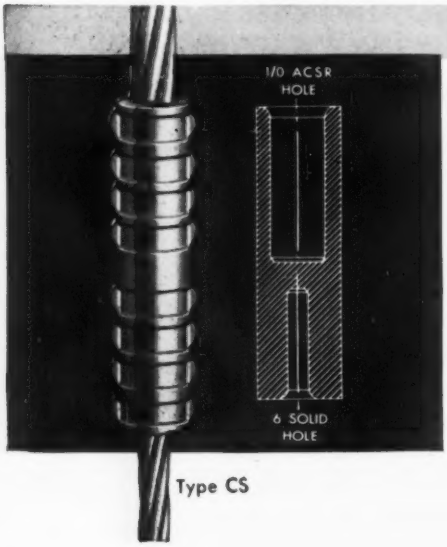
Type SH Prefilled



Type HT

Standardization now possible with Blackburn "H" frame connectors

- **Designed to fit the tools you already have for applying "H" frame type connectors.**
- **Full length tab completely seals out moisture, easiest to bend and install!**
- **Shot blasted to improve conductivity and retard corrosion.**
- **Prefilled with Blackburn's superior oxide-inhibiting compound, Contax, in easy-tear tab vacuum package.**
- **Color fast, large, easy-to-read lettering.**
- **Type HT is reversible, both grooves "open". For large aluminum tap to smaller copper main. Also used for dead ending.**



Type CS

You get higher conductivity with Blackburn service entrance sleeves

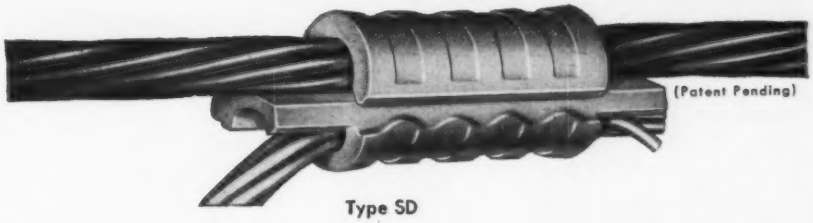
Blackburn—and Blackburn *alone*—provides greater contact area where needed, to assure greater conductivity. This is accomplished by increasing hole depth as the diameter of the conductor is increased, thereby providing more contact area for the conductors being connected.

The Color Coding is *printed* for quick, positive identification.

The sleeves' ends are sealed with Aluminum Sensitized Tape, which is easy to puncture . . . and, if a particle of the seal is pushed into the chamber, the particle is conductive.

Contax, Blackburn's superior oxide-inhibiting compound, is already in these sleeves *in measured amount.* Won't squirt out on glove or in face. And the solid center stop in a Blackburn Sleeve assures proper distribution of the inhibitor around the conductors. Designed for tooling you have.

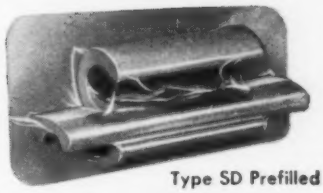
High "Use-Ability"



Type SD

Exclusive drip-guard separator in Blackburn 6-frame tap connector gives *extra* protection to bi-metallic connections

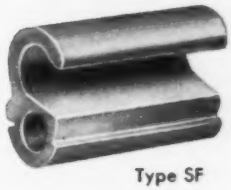
- Spacer allows SD Connector to be used for bi-metal connections with the tools you already have for "C" Frame type connectors.
- An economical substitute for "L" taps, since extended drip guard gives extra insurance against corrosion products bridging the bi-metallic gap.
- A true *two-handed* connector, very adaptable for hot line work.
- Shot blasted for highest conductivity and corrosion resistance.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



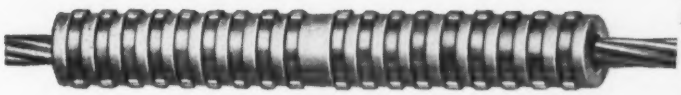
Type SD Prefilled

Type SF

- Recommended for aluminum to aluminum.
- Spacer gives better protection against strand breakage.
- Can be installed with same tooling used for Type SD.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



Type SF



Type TR

Blackburn neutral repair sleeves save dollars on triplex services

- Salvage short lengths of pre-assembled service drop cable with Blackburn Sleeves.
- Designed for and tested with the tools you already have.
- Extra length engineered for neutral pullout values in keeping with dead end devices.

See JB Catalog 858 for Tooling INFORMATION

LIVE BETTER ELECTRICALLY

JASPER BLACKBURN CORPORATION

1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430

Truck Equipment Company
3963 Walnut Street, Denver 5, Colorado Dept. 23

Gentlemen:

I am interested in how Truco can solve my stringing and reconductoring problems. Please send your Tensioning Brochure *today*.

Name

Firm Title

Address

City State

Pulls and Tensions FOUR Conductors Simultaneously

▽

Saves More Than 75% in Labor Costs

▽

Truco

Saves More Than 75% of Initial Equipment Costs

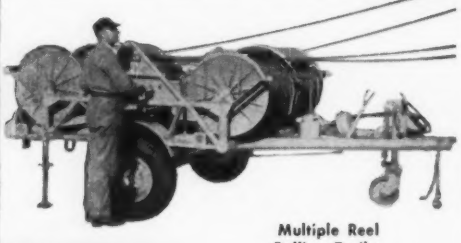
▽

Uses ONE Puller and ONE Tensioner to do the Complete Stringing and Reconductoring Job

▽

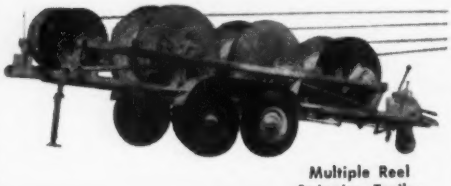
Strings or Replaces Conductors Safely, Simply and Efficiently

▽



Multiple Reel Pulling Trailer

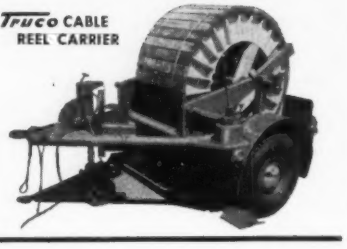
NEW TENSIONING EQUIPMENT



Multiple Reel Stringing Trailer

Complete utility and maintenance hydraulic equipment

Truco AERIAL LADDER



Truco CABLE REEL CARRIER

Truco AERIAL LIFT

Truco DERRICK

Write or phone for full details

Truco

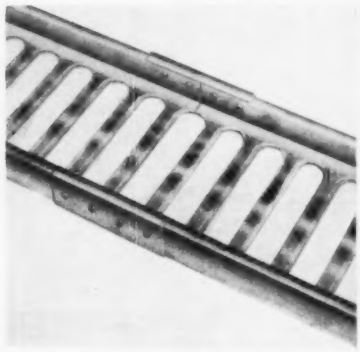
Ask for name of nearest distributor

TRUCK Equipment COMPANY

3963 WALNUT ST. • AComa 2-7905 • DENVER 5, COLORADO

Cable Tray . . .

(*Continued from page* 142)



slot opening is 2 in. with turned down edge all around. Known as Type "E", it is furnished in galvanized steel and aluminum.
P-W Industries, Inc, 11200 Roosevelt Blvd, Philadelphia 15, Pa.

More New Products

Hydrion **battery-water unit** converts tap water to pure battery water. The C59B-H is attached to any water faucet.—A. E. Tomkin & Co, 1507 M St, N W, Washington 5, D. C.

Conversion unit converts obsolete flasher warning lights to meet modern safety standards. Model WC-5 is a transistorized incandescent flasher circuit encapsulated in a plastic container.—Pacific Mercury Co, 14052 Burbank Blvd, Van Nuys, Cal.

Ultrasonic cleaner for high energy density applications features 2-gal stainless steel tank. It is known as Model 220.—National Ultrasonic Corp, 111 Montgomery Ave, Irvington, N. J.

Bridging equipment provides 30-ft span for assembly of adjustable-height work platforms with vertical clearances up to 24 ft.—Up-Right Scaffolds, 1013 Pardee St, Berkeley 10, Cal.

Steam sampling **nozzles** have ports positioned so that sampling is proportional to the entire cross section of steam line.—Trinity Equipment Corp, Cortland, N. Y.

New ORANGEBURG® CA* CONDUIT *with Flush Coupling Attached!*

With no separate couplings to handle or attach on the job, Orangeburg CA lays faster, costs less to install. Each long, light length has a *flush* coupling attached at one end and a standard 2° male taper at the other end, making installation a simple, one-step operation. And, since the coupling *is* attached, there are no coupling cartons to warehouse or carry to the job.

What's more, with the coupling *flush* to the conduit's outside wall, new CA is easy to stack, store and handle. The flush coupling also eliminates "staggered" joints in the trench. And that means real savings in cutting and tooling time.

Like the hundreds of millions of feet of Orangeburg fibre conduit in use since 1893, new CA has self-sealing joints and impermeable walls. Its smooth, 100% fibre raceway adds years to cable life.

New Orangeburg CA is available in 2", 3", 4", 4½" and 5" sizes. Orangeburg Standard and Nocrete Conduit, with separate sleeve couplings, are available as always. Write Dept. EW-99. for Catalog 52.

ORANGEBURG MANUFACTURING CO.
Orangeburg, New York • Newark, California
A Division of The Flintkote Company, Manufacturers of America's Broadest Line of Building Products

Orangeburg Fibre Conduit is distributed by Graybar Electric Co. and General Electric Supply Co. with branches and stocks in principal cities.

NOW! *One new, brighter 40-watt lamp does the*

2800

NEW "UNIVERSAL" PREHEAT-RAPID START LAMP

YOU GET — more light per dollar — FROM WESTINGHOUSE

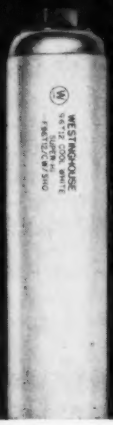
3200 LUMENS
(cool white)
In the highest-rated 40-watt lamp

Get 21% more light using your present rapid start fixtures . . . 3310 lumens in white and warm white! The new "Crestline" is the only fluorescent with no "lazy ends"—even the bases let light through (optional at slight extra cost). Life rated at 7500 hours at 3 hours per start.

9000 LUMENS
(cool white)
in the brightest 96" High Output lamp you can buy

Light output improved 23% over present H.O. type (High Output) lamps to make this the most economical 96" H.O. type lamp ever developed for application where high output lamps are used . . . 9300 lumens in white and warm white. This brightest of all 96" H.O. type fluorescents is rated at 7500 hours' life—more than 2 years' use in the average installation—and they're designed to operate on present 96" H.O. ballasts.

15,000 LUMENS
in the economical 96-in. (Super-Hi™) type lamp



New ballast equipment and improvements in lamp design have increased the light output of this single 8-foot S.H.O. lamp to 2½ times that of ordinary lamps. Smooth, tubular surface can't accumulate dust and cut down light. Rated at 7500 hours' life.

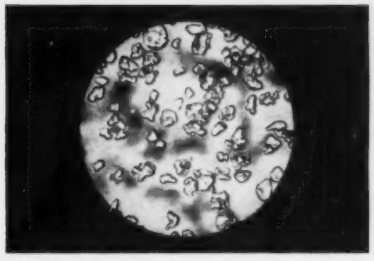
job that two different types have been doing!

LUMENS
(COOL WHITE)

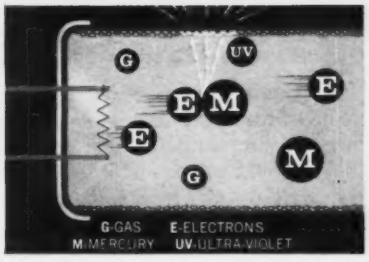
Simplify stocking, ordering and maintenance by specifying this one 40-watt fluorescent lamp for the job that two different types have been doing! The new Westinghouse "Universal" lamp can be used on either your present rapid start or preheat circuits with no loss in lumen output. You'll save storage space; save time and error in maintenance by stocking this one lamp.

Whether you're planning or expanding, you can use this lamp in your new fixtures, as well as in your existing ones. And here's the best news of all: light output has been increased to 2800 lumens, while the list price has been *reduced* to only $1.25—5¢ less than old style rapid start lamps!

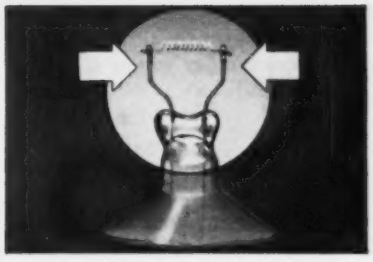
Only Westinghouse brings you these 6 LIGHT-BOOSTING ADVANCES



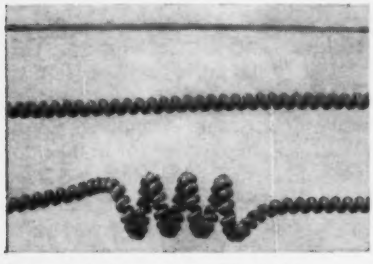
Ultralume™ Phosphors: Westinghouse research has proved that the size of the individual phosphor particles which coat the inside of a fluorescent lamp have a direct effect on the amount of light given off. Now, a new and exclusive Westinghouse process selects the right particle size for more efficient light-producing phosphors.



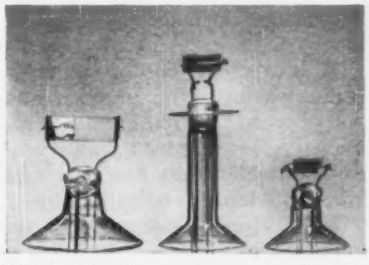
Mixed Gases: All fluorescent lamps contain mercury and gases. The gases serve as conductors until the mercury is vaporized. These gases and mercury vapor then convert electricity into ultra-violet radiation, which causes the phosphors to "fluoresce." Westinghouse uses the right mixture and pressure for each type of fluorescent lamp.



Plated Leads: The electron bombardment inside a fluorescent tube eventually causes particles of the metal supports and leads to sputter off causing "end blackening." To prevent this, Westinghouse plates the lead wires with super-hard chrome-vanadium. Result: tubes that *stay* brighter, end to end.



Triple Coiled Electrodes: Westinghouse uses triple wound electrode coils to hold the right amount of emission material. This carefully measured amount is heated quickly and adequately protected from bombardment to insure long life and trouble-free starting.



"Custom" Anodes: Anodes act as buffers and prevent excessive "sputtering" of emission material from the electrodes. Since the electrical characteristics are different for each type of fluorescent lamp, Westinghouse anodes are especially engineered to fit the electrical requirements of each type of lamp.

Silicone "Raincoats": In high-humidity areas, moisture can collect on the exterior surface of the lamp and prevent it from starting. To protect against moisture accumulation, Westinghouse fluorescents are given a special Silicone coating, or "raincoat," which disperses this film into harmless droplets.

CONTACT YOUR LOCAL WESTINGHOUSE LAMP AGENT, OR WESTINGHOUSE LAMP DIVISION, BLOOMFIELD, N. J.

These new fluorescent advances are made possible by the same Westinghouse Research which brought you . . .

NEW SHAPE . . . NEW LIGHT . . . WESTINGHOUSE EYE SAVING WHITE BULBS . . . *Another reason why—*

YOU CAN BE SURE...IF IT'S Westinghouse

Southern California Edison Appliance Su

Mail surveys found to be inexpensive yet effective. Company gets 80% of questionnaires back at cost of 16¢ per form

V. L. **SCOVEL**, Economic Analyst,
Southern California Edison Co

Southern California Edison Co has found that mail surveys provide a relatively inexpensive and efficient method of estimating the number of selected appliances bought by its customers and determining appliance saturation as well.

This type of survey is particularly efficient, compared to traditional reporting by dealers and distributors, for a utility whose service territory interlaces with that of others. Eight other utilities have all or part of their service areas within Southern California Edison's.

Some of the areas have no natural boundaries, and volume dealers frequently sell to customers in adjacent areas. These conditions severely limit appliance dealer or distributor report value. Also, used appliance purchases, quite likely of significant proportions, can be obtained only by customer contact.

We feel we have overcome an inherent shortcoming of most mail surveys: The small percentage of questionnaires returned. Non-respondents' characteristics generally vary considerably from respondents', so in any sample-type survey, the larger the percentage return, the more nearly the survey's estimate will represent the utility's aggregate customers.

A mail survey method designed by the company has produced over 80% return on 10,000 inquiries at about 16¢ per returned questionnaire. This gave an 0.7% sample of Edison's residential customers, and provided data estimated to be within 99% accuracy.

The over 80% return was considered adequate for its purpose, and much greater than response to old-type surveys previously used.

Here are elements of the new survey we feel contributed to the high response:

1. Simple questionnaire. It was designed so the respondent could simply check the answers. This also facilitated coding and tabulation of answers prior to analysis.

2. Postage stamp on the questionnaire. Use of a stamp, rather than a postal permit, was felt to attach an aura of value to the questionnaire. A commemorative stamp, used in four of the six surveys, attracted special attention. A response increase from 76% to over 80% was noted when a commemorative stamp was used.

Questionnaire Affixed to Bill

3. Questionnaire affixed to and mailed with utility bill. Mailing the questionnaire with the bill insured that it would not be discarded without being opened. Fastening to the bill meant the questionnaire would be viewed by the customer after receipt.

4. Instruction paragraph signed by non-commercial representative. A "Planning and Program Committee" was given as the source of the questionnaire, to promote the idea that the questionnaire was related to planning.

5. Instructions worded in a compelling manner. The customer was not "begged" to return the questionnaire, but informed simply why the information was necessary and asked to return the completed form.

6. Customer's name not on questionnaire.

7. Postcard follow-up sent in two weeks.

Attesting to the effectiveness of a follow-up were the numerous customers who wrote or called to ask for questionnaires to replace those destroyed or lost. Tests indicated the follow-up increased response by about one-third.

Dr. Arthur Highman, consulting statistician and associate professor, University of Southern California, assisted in the design of the questionnaire.

It was mailed to 10,000 residential customers over a two-month billing cycle. Bills of customers to whom questionnaires were to be mailed were chosen prior to the last step in the regular mailing procedure.

One out of every 125 bills was picked at random from each day's mailing. Thus the sample, 0.8% of Edison's residential customers, was evenly distributed throughout the service area.

After the sample was chosen, each questionnaire was stamped with the mailing date, the area (district) of the customer's residence, and his kwhr usage for the billing period.

The questionnaire was affixed to the bill, and the customer's name, address and kwhr usage were typed on gummed address labels, with a carbon copy kept for a record. The labels were put on the follow-up cards for mailing two weeks later to the entire sample.

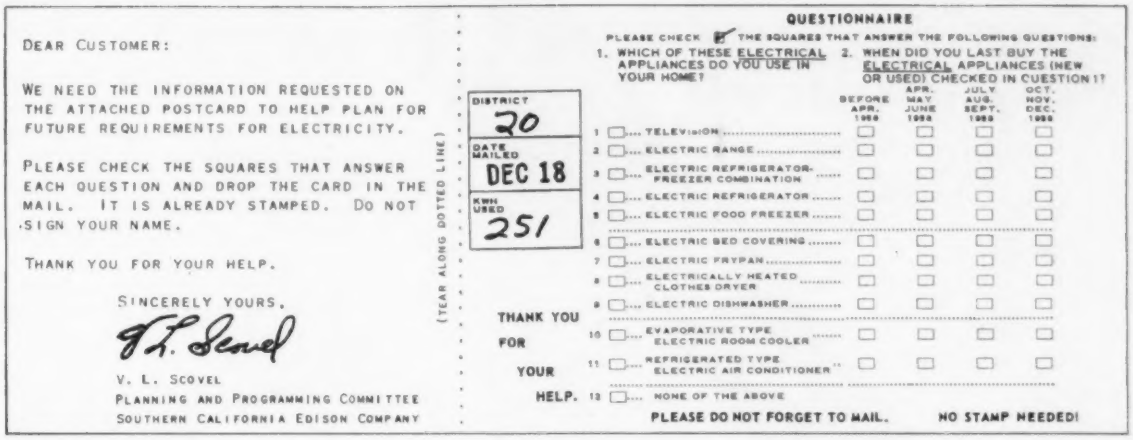
The various appliance saturations were estimated by tabulating the number of questionnaires reporting the appliance and comparing with the total number of questionnaires returned. Unit purchases were estimated by applying the percentage of respondents reporting a purchase to total residential customers.

Use of the fairly inexpensive mail survey permitted a large sample, thus minimizing sampling error. With a sample size of 8,000 for Edison, actual saturation will vary from the estimate by less than $\pm 1\%$, as a result of sampling error, sufficiently reliable for practical purposes.

Although appliance saturation and customer purchases by periods were the survey's principal objectives, important other data were derived. Significant among these was average kwhr usage during the billing period for each appliance.

With machine tabulation of questionnaires it is feasible to compute average kwhr usage of customers having selected groups of appliances. Then, by subtraction, each

Survey Method Produces 80% Reply



DEAR CUSTOMER:

WE NEED THE INFORMATION REQUESTED ON THE ATTACHED POSTCARD TO HELP PLAN FOR FUTURE REQUIREMENTS FOR ELECTRICITY.

PLEASE CHECK THE SQUARES THAT ANSWER EACH QUESTION AND DROP THE CARD IN THE MAIL. IT IS ALREADY STAMPED. DO NOT SIGN YOUR NAME.

THANK YOU FOR YOUR HELP.

SINCERELY YOURS,

V. L. SCOVEL
PLANNING AND PROGRAMMING COMMITTEE
SOUTHERN CALIFORNIA EDISON COMPANY

(TEAR ALONG DOTTED LINE)

DISTRICT 20
DATE MAILED DEC 18
KWH USED 251

THANK YOU FOR YOUR HELP.

QUESTIONNAIRE

PLEASE CHECK ☑ THE SQUARES THAT ANSWER THE FOLLOWING QUESTIONS:

1. WHICH OF THESE ELECTRICAL APPLIANCES DO YOU USE IN YOUR HOME?

2. WHEN DID YOU LAST BUY THE ELECTRICAL APPLIANCES (NEW OR USED) CHECKED IN QUESTION 1?

		BEFORE APR. 1958	APR. MAY JUNE 1958	JULY AUG. SEPT. 1958	OCT. NOV. DEC. 1958
1	TELEVISION				
2	ELECTRIC RANGE				
3	ELECTRIC REFRIGERATOR-FREEZER COMBINATION				
4	ELECTRIC REFRIGERATOR				
5	ELECTRIC FOOD FREEZER				
6	ELECTRIC BED COVERING				
7	ELECTRIC FRYPAN				
8	ELECTRICALLY HEATED CLOTHES DRYER				
9	ELECTRIC DISHWASHER				
10	EVAPORATIVE TYPE ELECTRIC ROOM COOLER				
11	REFRIGERATED TYPE ELECTRIC AIR CONDITIONER				
12	NONE OF THE ABOVE				

PLEASE DO NOT FORGET TO MAIL. NO STAMP NEEDED!

THIS QUESTIONNAIRE was sent to 10,000 customers in the SoCalEd service area. Outstanding feature was that the customer could simply check the answers. This also facilitated tabulation of answers. Form was sent with the utility bill

appliance's average consumption during the questionnaire's billing period may be estimated.

For example, the difference between average kwhr consumption of those customers having TV, a refrigerator and a electric frypan, and that of customers having TV and refrigerator only, equals average usage of an electric frypan.

Although the customer's name and address did not appear on the questionnaire, the respondent can be easily indentified by comparing his kwhr usage, shown on the questionnaire, with those of customers in his district to whom questionnaires were mailed on that day.

Identification of certain customers provides basis for future mail or interview surveys to secure other valuable information. For example, customers reporting a range purchase could be surveyed to determine their characteristics, or why they bought an electric rather than gas range. This can be used as sales and advertising planning data.

The survey's direct costs were fairly nominal. Cost of printing the questionnaire and follow-up cards, plus postage, totaled $872. Processing 235 questionnaires daily required about five hours, a total of 210 man-hours for the entire survey. Total cost was about 16¢ per returned questionnaire, exclusive of planning, editing and machine tabulation.

EEI Makes Zeuthen Program Manager of LBE Program

Ralph Zeuthen has been appointed program manager of the Live Better Electrically Program of the Edison Electric Institute.

He will head the $2½ million program which was previously known as the National Electric Living Program.

For the past two years, Zeuthen has been president of Zeuthen, Thomas & Hulbert, a Minneapolis, Minn. advertising agency. Prior to that, he was vice president and assistant to the president of Campbell-Mithun, handling accounts which included the advertising program of the Northern States Power Co and its promotion of Housepower. He has also served as assistant director of public relations for Northwest Airlines, and as a reporter on several Minnesota newspapers.

Bruce Foster, formerly with Erwin Wasey, Ruthrauff & Ryan, has also joined the LBE staff.

(*More Selling on p* 154)

ZEUTHEN

SUPERIOR
CABLES

developed
for you
by communication
specialists

The way to make sure the cable you buy is the cable you need is to bring your problem to SUPERIOR!

From your specifications, SUPERIOR communication specialists will originate the design and construct the cable to meet your requirements.

Plastic insulated and jacketed SUPERIOR CABLES are packed full of performance.

When you have any cable problem . . . tell it to SUPERIOR!

For complete information and prices, write

SUPERIOR CABLES

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

4279

Older Homes Suffer From Low Housepower

Inadequate wiring is the main reason homes over ten years old are hard to sell. This fact was established by a survey recently conducted by the engineering concern of Home Inspection Consultants, Inc.

According to Arthur Tauscher, president of the firm, 84% of the 1,000 dwellings surveyed had one or more deficiences relating to the electrical service. In many cases the home had insufficient power to support the large number of appliances now being used.

Even if there is adequate power, however, older homes do not have enough circuits, Tauscher said.

In homes more than 35 years old, the survey found that complete internal rewiring was often needed.

Termite damage was found to be the second largest cause of home deterioration.

EEI Issues Farm Electric Sales Handbook

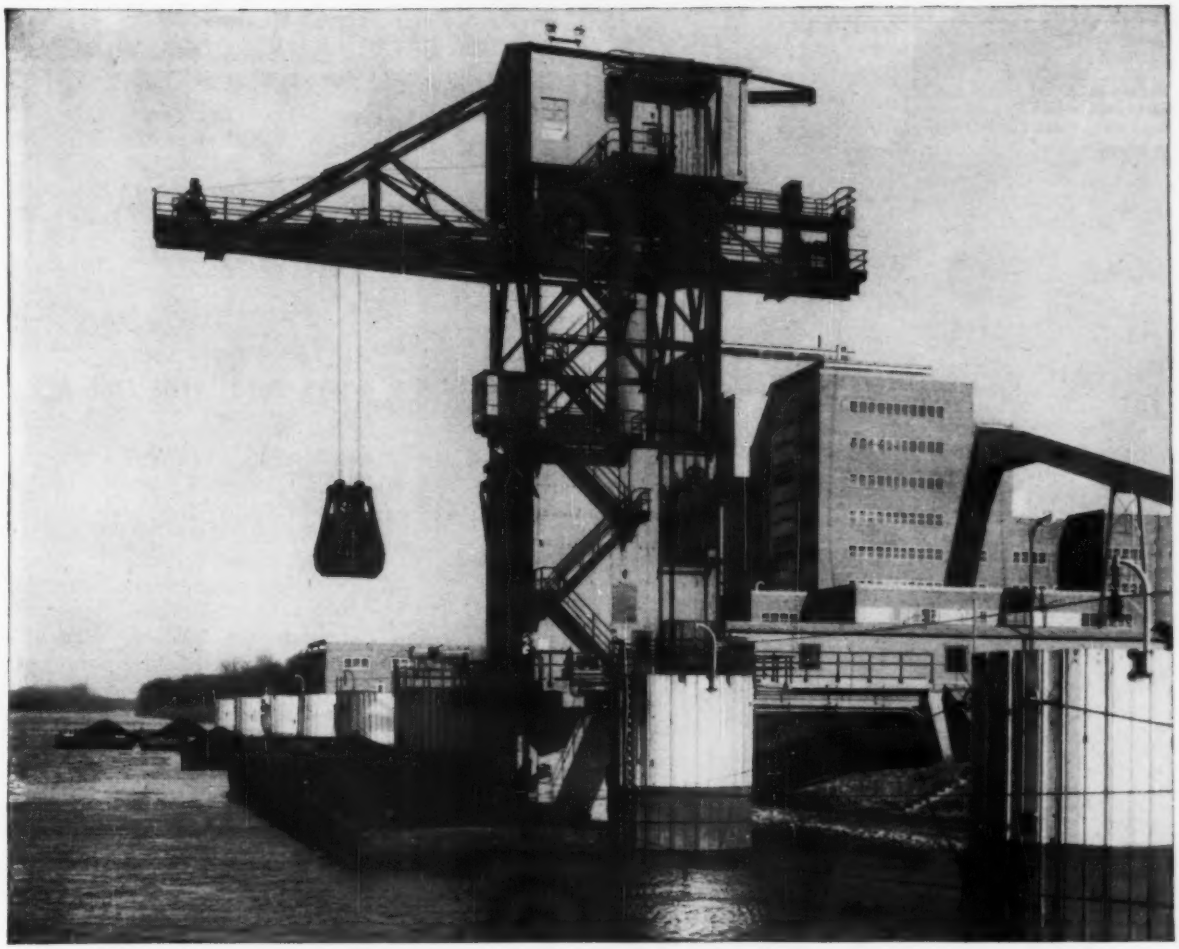
A 66-page Farm Electric Sales Handbook has been published by the Farm Group of Edison Electric Institute. It is designed for use by rural salesmen of electric power companies, electric equipment manufacturers, agricultural extension services of colleges, etc.

Subjects covered include, sprinkler irrigation systems, under-floor electric heating cable, heating cable to prevent pipes from freezing, electric equipment for the farm shop, electric dairy equipment, electric brooding, egg cooling and storage.

Each section outlines the principal advantages of the equipment and gives size of equipment needed for various uses, capacities, operating costs, installations costs, initial investment costs, and average kwhr use.

The book also contains tables showing the estimated kwhr use by various items of farm electric equipment, wire sizes for indoor and outdoor use, resistance and weight of electrical conductors, and wiring carrying capacities.

(*Continued on p* 156)



At Illinois Power Co.'s Hennepin Station:

Dravo-built coal unloader to handle 4 times original plant capacity without modification

As the Illinois Power Company quadruples the capacity of its Hennepin Station, on the Illinois River, the rewards of proper long-range planning are apparent.

Because the company, and its consulting engineers, Sargent & Lundy, planned for the future six years ago, the greatly enlarged capacity is being accomplished without need for new unloading equipment or for modification of the present Dravo coal unloader.

When the Hennepin Station was first built, it housed only a single generating unit. However, Illinois Power anticipated its load growth, and at that time installed a Dravo coal unloader large enough to handle a second unit.

The full production of the unloader could not be used with the single unit, but now that an additional 225,000 kw unit has been placed in operation, the Dravo unloader is of sufficient capacity to handle the entire production.

Whether you must build for tomorrow's requirements, or to meet the pressing needs of today, Dravo's broad experience in coal unloading equipment can help make your investment more profitable.

Complete information on this important area of utility operation is readily available. Contact Crane and Bridge Department, DRAVO CORPORATION, PITTSBURGH 25, PA.

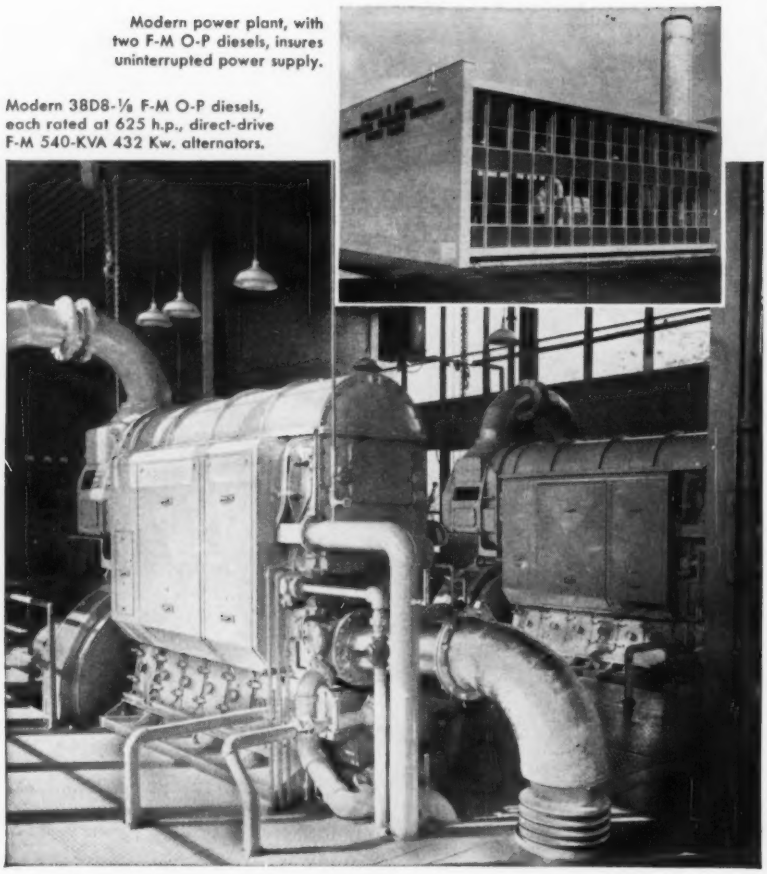
DRAVO

CORPORATION

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

Modern power plant, with two F-M O-P diesels, insures uninterrupted power supply.

Modern 38D8-⅛ F-M O-P diesels, each rated at 625 h.p., direct-drive F-M 540-KVA 432 Kw. alternators.



Miner installs power security!

In line with an increasing trend among institutions and industries, the new William H. Miner Agricultural Research Institute near Chazy, New York has installed a complete Fairbanks-Morse diesel-electric plant as positive protection against power failure.

The compact installation shown above features two Fairbanks-Morse Opposed-Piston diesels, direct-driving Fairbanks-Morse alternators.

The plant is completely self-sufficient. Should the area's hydro power supply fail, a 6-kw. Model 45 F-M diesel-generator set powers a motor-driven starting air compressor and pre-lube pumps to let the operator start one of the big F-M diesels in a hurry.

Find out why F-M two-cycle Opposed-Piston diesel power is unsurpassed for compactness, dependability and economy. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL, DUAL FUEL AND GAS ENGINES • LOCOMOTIVES • ELECTRIC MOTORS • GENERATORS
PUMPS • SCALES • COMPRESSORS • MAGNETOS • HOME WATER SYSTEMS

Farm Handbook

(*Continued from p* 154)

The handbook is in loose-leaf form so amendments and additions can be added from time to time. Copies may be obtained from EEI, 750 Third Avenue, New York 17, N. Y. Price: $3.50 per copy, plus postage.

Air Force Base Gets 1,255 All-Electric Homes

A Florida air force base has added 1,255 all-electric homes.

The Homestead Air Force Base recently completed a housing project which features all-electric kitchen laundries, electric water heating and year around electric air conditioning. Included in each home are the following electrical appliances: Refrigerator, food-waste disposal, range, air conditioner, water heater, automatic washer and clothes dryer.

"We believe housing like this will help keep our trained personnel in the service," said, Lt. Col. William H. Branch, Jr., assistant base commander.

Says a master sergeant's wife, "This is the nicest house we've ever lived in. Living is certainly better with all my electric appliances. . ."

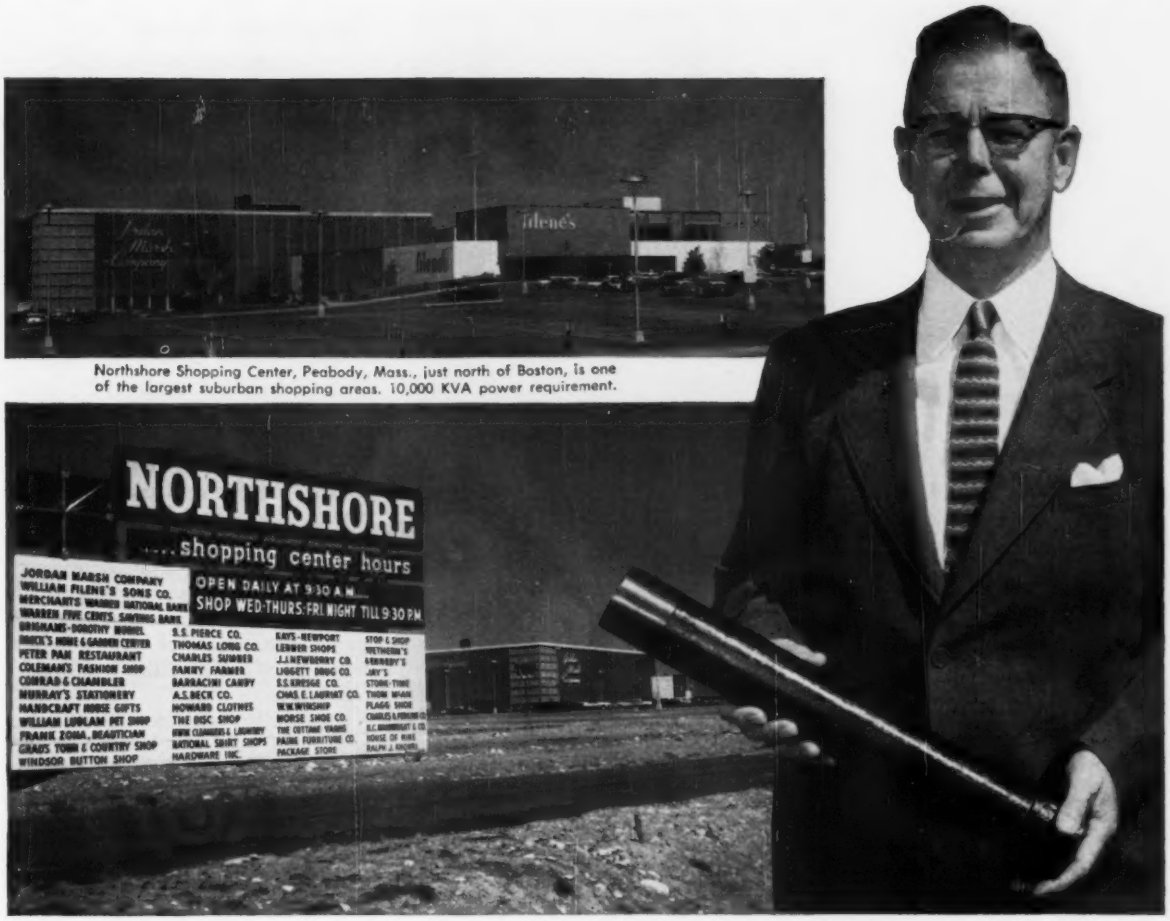
Florida Power & Light Co recently saluted the project in a full-page ad in its "Dealer Sales Developer."

Saturation Survey Shows Louisiana Sales Up

An appliance saturation survey conducted earlier this year is being used by Louisiana Power & Light Co appliance dealers as a sales aid. In addition to saturation figures for the entire service area, each dealer was given a localized survey study of his own area.

Saturation figures, with 1955 figures where available, are: Electric range, 14.7% (8.9); electric water heater, 7.7% (6.1); refrigerator, 95.6% (93.8); food freezer, 37.4% (28.6); dishwasher, 9.6% (4.7); disposal, 4.4%; washer,

(*Continued on p* 158)



Northshore Shopping Center, Peabody, Mass., just north of Boston, is one of the largest suburban shopping areas. 10,000 KVA power requirement.

"Putting in BERMICO CONDUIT was the easiest part of the job"

AL KENWORTHY,
Electrical Contractor, Everett, Mass.

"When I saw the area to be wired, I expected the worst," reports Mr. Kenworthy, President of Kenworthy & Taylor. "It was craggy, rooted, and uneven."

"Luckily, Bermico was the specified conduit. Bermico is lightweight. It's easy to work with . . . its fittings simplify every installation problem. Putting in Bermico Conduit was the easiest part of the job."

For fast, money-saving installations . . . use Bermico on all your jobs. Bermico is made from cellulose fibre, impregnated with coal tar pitch. Each 8-foot length is precision engineered, with smooth inside bore to allow easy cable pull-through without abrasion. It has high dielectric strength. Bermico is long lasting, too . . . extremely resistant to acids, alkalies, heat, water and corrosion. Try it.

Distributed by WESTINGHOUSE Electric Supply Company and Agent Jobbers Offices in Principal Cities

Another Quality Product of

BROWN QUALITY COMPANY

General Sales Office: 150 Causeway Street, Dept. 1399, Boston 14, Mass.

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LGP-30

ROYAL PRECISION

Electronic digital computer permits load-flow calculations on networks of up to 100 busses and 270 lines at lowest cost

Gives you optimum level efficiency in production, sales, purchase!

The lowest-priced complete computer you can buy, the versatile LGP-30 saves you time and money by 1) economically solving your load-flow problems; 2) forecasting optimum turbine-generator and boiler usage under varying conditions of system demand; 3) optimizing purchase and sales of power.

Now at work serving numerous electrical utilities, the compact, mobile LGP-30 operates from any convenient wall outlet . . . requires no expensive air-conditioning or installation. It gives you twice the capacity of any computer in its class, yet is by far the easiest to program in basic machine language.

Internal components of the LGP-30 have been greatly reduced to insure highest reliability. Operation has been remarkably simplified. Your personnel are quickly trained by Royal McBee without charge. Sub-routines and programs are available – as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast. For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N.Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

ROYAL McBEE · *data processing division*

Saturation Survey

(*Continued from p* 156)

79.1% (81.6); washer-dryer, 2.8%; electric dryer, 11.8% (4.5); electric room heating unit, 8.8%; and television, 88.8% (66.2).

Eisenhower Gets Cool Reception

When President Eisenhower walked into his August 25 press conference he got a cool reception. For the first time the news conference room, the Indian Treaty Room of the old State Department, was air conditioned.

The changeover was started by a reporter asking at a previous news conference why a government which sent mice into space and submarines under the polar ice cap couldn't find a way to cool the conference room.

Eisenhower commented that the press was one "pressure group" whose power he respected, and an air conditioning unit was then installed.

Gas Industry Looks To Air Conditioning Market

The gas industry is concerned about losing the heating market to electricity. But this is tempered by the fact that they might gain a market in return—air conditioning. Harold Massey, managing director of the Gas Appliance Manufacturers Assn said recently that manufacturers regard electric heating as up-and-coming competition and expect it will assume "major competitive status."

David W. Hoppock, vice president, Bryant Manufacturing Co, noted that residential gas air conditioners present, utilities with an opportunity to even out the summer and winter peaks. He said that gas models are quieter with longer life and that this and other selling points should overcome the $300 to $400 price differential.

Another sales suggestion was that utilities tie in with architects, home builders and model homes.

(*More Selling on p* 160)

In high voltage transformers, other heavy duty electrical and electronic equipment...

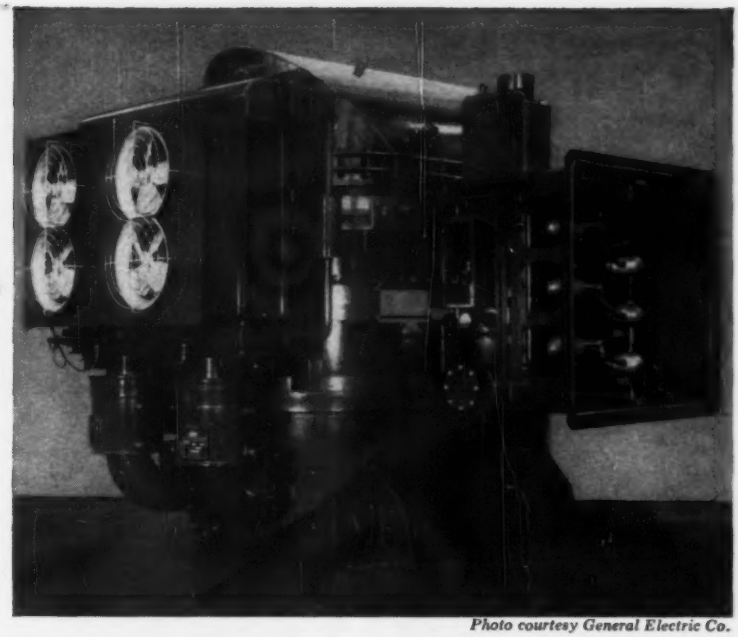


Photo courtesy General Electric Co.

THE TREND IS TO GASEOUS INSULATION WITH B&A® SULFUR HEXAFLUORIDE

The trend in requirements for high voltage equipment is toward higher operating voltages, units of minimum size and weight, greater safety and lower maintenance costs. For these reasons, sulfur hexafluoride is being used to insulate a wide variety of electrical and electronic equipment.

Sulfur hexafluoride is not only the preferred gaseous dielectric—it has also proved superior to liquid insulation in many applications. For example, the use of SF_6 instead of oil to insulate high voltage transformers has the following advantages:

High Dielectric Strength

At atmospheric pressure, SF_6 has a dielectric strength 2 to 3 times that of air, nitrogen or carbon dioxide. This favorable ratio increases with pressure so that in the range of 2 to 3 atmospheres SF_6 has a dielectric value roughly equivalent to transformer oil.

Efficient Over Wide Temperature Range*

SF_6 is stable in the presence of most materials of construction up to temperatures of about 150°C; remains a gas down to −63.8°C.

*Where extreme inertness to other materials is required or when service conditions involve temperatures in the range of 150°C to 250°C (or higher!), Baker & Adamson's Perfluoropropane (C_3F_8) is recommended.

Reduces Noise Level and Weight of Equipment

Both the noise level and weight of transformers can be reduced substantially by insulating with SF_6 rather than with a liquid. The low noise feature is particularly important where residences are nearby. Weight savings pay off for portable equipment and reduce installation costs for stationary equipment.

Safe to Use

SF_6 is non-toxic, chemically and physiologically inert, fire-proof and explosion-proof.

Installation Savings

Installation in fire-proof vaults is eliminated and bus runs can be shortened drastically due to closer proximity of transformer to generator.

Many of these advantages are also applicable to other commercial uses of sulfur hexafluoride, such as in:

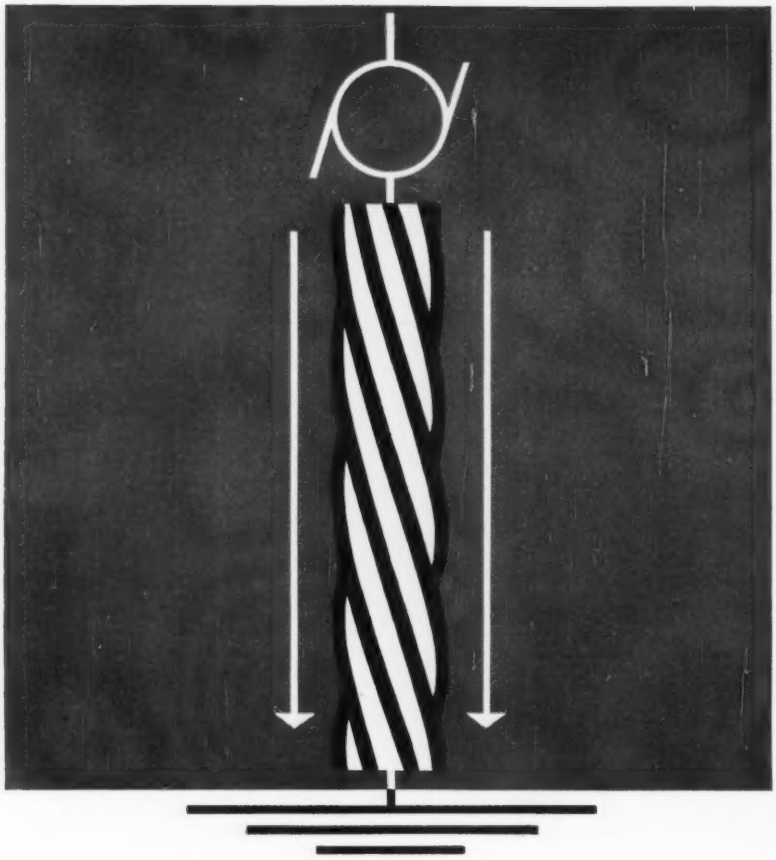
Interrupter Switches
Radio and Microwave Frequency Power Transmission
X-Ray Equipment
Audio Equipment
Cathode Ray Accelerators
Van de Graaff Machines
Television Filterplexers
Radar Duplexers
Gap Tubes
Switch Gear
Wave Guides
Airborne Electronics
Silicon Rectifiers

Investigate all the advantages of B&A Sulfur Hexafluoride gaseous insulation *now*. Write for technical literature.

BAKER & ADAMSON® Electronic Chemicals

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.



It's safe... it's grounded with

CF&I Galvanized Steel Strand

When grounding electrical installations, you can't afford to use "second best" wire. Insist on a dependable steel strand that will give years of trouble-free service – CF&I Galvanized Steel Strand. Woven in seven- or three-wire constructions, CF&I Galvanized Steel Strand is made in accordance with ASTM Specification A-363 zinc coated steel Overhead Ground-Wire Strand.

For guy, messenger and other applications we recommend ASTM Specification A-122. *CF&I is also prepared to produce uniformly galvanized strand to your own specifications.*

Remember . . . for quick delivery and complete information, call the nearby CF&I sales office or your local electrical distributor.

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: **THE COLORADO FUEL AND IRON CORPORATION** — Albuquerque · Amarillo · Billings · Boise Butte · Denver · El Paso · Farmington (N. M.) · Ft. Worth · Houston Kansas City · Lincoln · Los Angeles · Oakland · Oklahoma City Phoenix · Portland · Pueblo · Salt Lake City · San Francisco San Leandro · Seattle · Spokane · Wichita

In the East: **WICKWIRE SPENCER STEEL DIVISION** — Atlanta · Boston Buffalo · Chicago · Detroit · New Orleans · New York · Philadelphia

CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary · Edmonton · Vancouver · Winnipeg

6568

Westinghouse Forms Appliance Rental Plan

Westinghouse Electric Corp has come up with a plan to rent brand new appliances to apartment house owners and operators and replace them with newer models at frequent intervals.

The proposal, which offers two, three and five-year lease arrangements, is being made to owners and operators of multiple dwelling units in New York, Washington, Chicago, San Francisco, and Los Angeles.

Service labor charges are included in the lease for the entire contract. The used appliances replaced at the conclusion of a rental period will be reconditioned by Westinghouse distributors and sold through dealers specializing in used appliance sales.

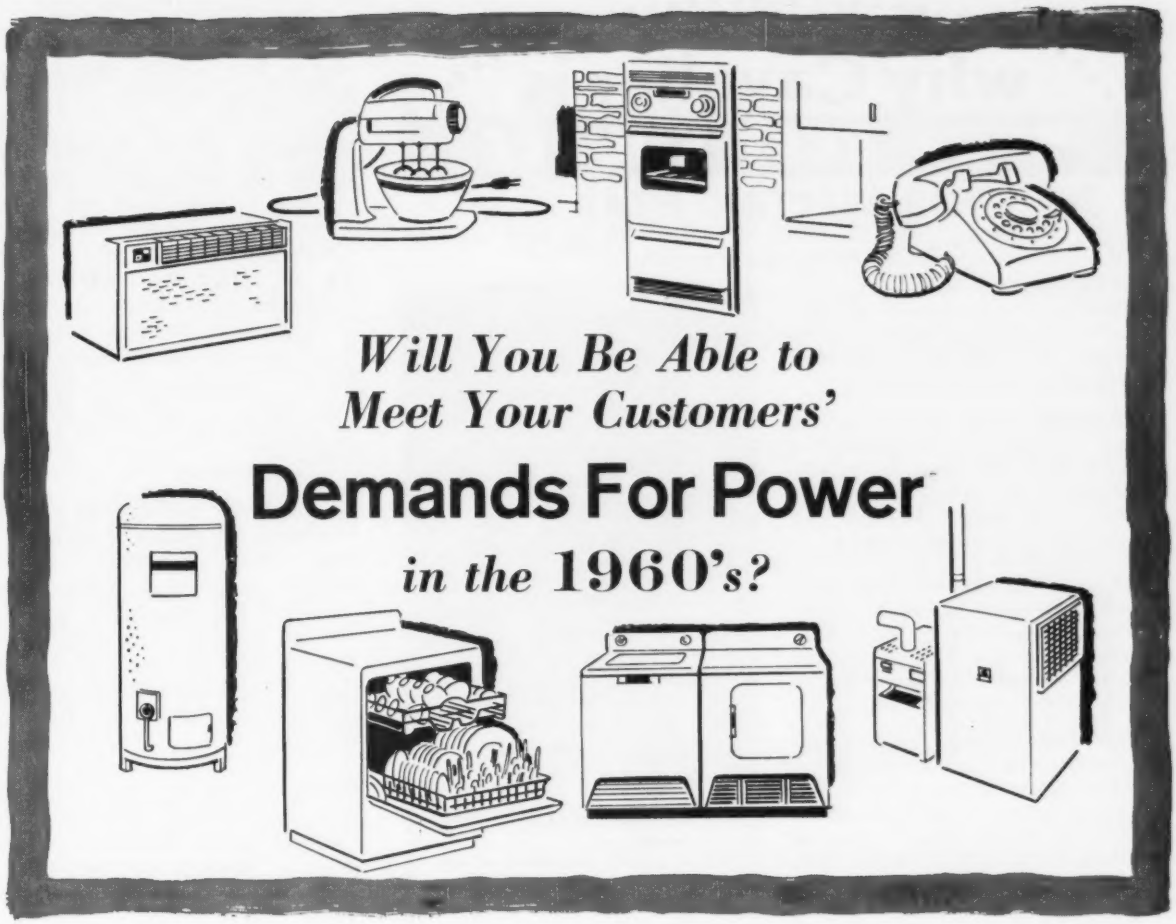
SELLING BRIEFS

The Bureau of Home Appliances of San Diego will sponsor the 26th annual Electrical & Home Appliance Show from Nov. 27 to Dec. 2. All major and small appliances, lighting and wiring equipment, radio, TV and stereo equipment will be displayed.

An appliance-buying mood in consumers is forecast by the Federal Reserve Bank of Philadelphia. This is tied directly into the continuing business boom, and will provide "a banner year for appliances and entertainment devices." A survey by the Bank also found that luxury models were favored over stripped ones, and there was a growing preference for brand names.

Newspapers throughout the United States and Canada will help the appliance industry to focus consumer and trade attention on all electric appliances in a concerted drive this November. It is timed to put appliances in the consumer's mind during the Christmas buying season. An expanded "Operation Snowflake" will be the promotion's core and will be sponsored by U. S. Steel, Newspaper Advertising Executives Assn, American Assn of Newspaper Representatives, and National Newspaper Promotion

(*Continued on p* 162)



It is estimated that by 1965 the total industrial, residential and commercial sales of electric power will have increased 78% over 1958; those of gas, 48%. To help utility companies prepare for this growth, Kidder, Peabody & Co. and Kidder, Peabody & Co., Incorporated last year took an active part in the underwriting and sale of 93 new utility issues amounting to more than $1,660,000,000.

Through Kidder, Peabody's 25 offices from coast-to-coast we have the extensive contacts and facilities to achieve a prompt, economical distribution of new issues. You are cordially invited to call on us at any time for detailed information on how your corporation can meet its requirements for additional capital in the decade ahead.

A partial listing of power companies whose issues were managed, co-managed or placed privately by Kidder, Peabody & Co. and Kidder, Peabody & Co., Incorporated appears at the right.

KIDDER, PEABODY & CO.

FOUNDED 1865

Members New York, American, Boston, Philadelphia-Baltimore, Midwest and Pacific Coast Stock Exchanges

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BOSTON PHILADELPHIA CHICAGO LOS ANGELES SAN FRANCISCO

Central Louisiana Electric Company, Inc.
Delaware Power & Light Company
Equitable Gas Company
Florida Power Corporation
Florida Power & Light Company
Florida Telephone Corporation
General Telephone Company of California
Georgia Power Company
Hilo Electric Light Company, Ltd.
Idaho Power Company
Michigan Gas Utilities Company
New York State Electric & Gas Corporation
North Carolina Natural Gas Company
Northern States Power Company
Pacific Power & Light Company
Panhandle Eastern Pipe Line Company
Potomac Electric Power Company
Public Service Company of New Hampshire
South Carolina Electric & Gas Company
Southern New England Telephone Company
Texas Power & Light Company
United Utilities, Incorporated
Upper Peninsula Power Company
Washington Water Power Company

why Cavalier is YOUR BEST SOURCE FOR ELECTRIC HEAT

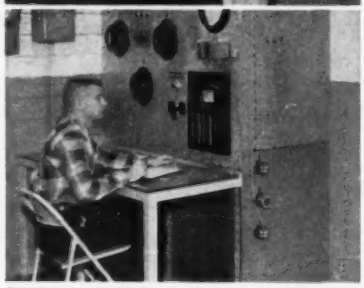
CAVALIER electric heat has real **quality.** It's easy to sell, pleases customers and eliminates costly service calls. (People are sick and tired of shoddy merchandise.)

CAVALIER has a complete line of electric heaters, all QUALITY GUARANTEED by a financially sound firm since 1865 for its policy of making quality products and pricing them fairly **at all times.**

CAVALIER equipment is soundly built. Each unit is individually energized and high potted with 1,000 volts. Although repair parts are rarely needed, they are promptly available at reasonable cost.

CAVALIER is active in NEMA and other organizations devoted to the advancement of the electrical industry, keeps to efficient trade channels and works to assure a business-like profit for the distributor and the contractor.

CAVALIER is your assurance of Highest Quality products with complete sales and merchandising helps, plus regular advertising in leading shelter publications.



Personnel and equipment of the specialized research, engineering and testing facilities for Cavalier electric heat are outstanding. Cavalier was one of the first quantity manufacturers of electric heat and has always built to Highest Quality Standards.

Cavalier has a complete line with quality features combined in no other line. **Automatic Electric Baseboard** — fully enclosed element with continuous vertical fin. Easiest cleaning of any baseboard on the market. Approximately 200 watts per lineal foot yet maintains low 125° surface temperature. Thermostatic control sections or wall mounted thermostat. 115 volt convenience outlet sections. Built in raceways for wire.

Send for catalog showing full line — Baseboard, Wall Insert, Portable, Bathroom, Floor Furnace, Cable Heat.

FIRST ▸

- *in quality construction*
- *in engineering advances*
- *in safety*
- *in sales making features*

HEAT BETTER ELECTRICALLY

ELECTRIC HEATING DIVISION

CAVALIER CORPORATION, Chattanooga 2, Tenn.

Over 90 Years of Quality Products

(*Continued from p* 160)

Assn. Electrical associations, including EEI, NAED, NEMA, and AHLMA will cooperate.

Residential use of electricity is leveling off. While consumption will continue to grow, there will be be a slowdown in the rate of increase. Today, the appliances of the postwar era which are credited with residential electrical load reaching 170 billion kw last year have lost their potential for boosting consumption of electricity at the rate they had in the past, according to an article in the *New York Herald Tribune.*

An all-electric model home will be featured in the display of the Hydro Electric Power Commission of Ontario at the Canadian National Exhibition. The educational aspects of electric home heating featured in the all-electric home will be emphasized. Various methods of wall construction, with the proper type of insulation, will be illustrated.

Here's an interesting quote from an enthusiastic electric heat owner in Commonwealth Edison's service area, as reported by Thomas G. Ayers, vice president, Commonwealth Edison Co, to company stockholders; ". . . living in a large ranch type contemporary home without electric heat would be, to us, unthinkable . . . we are living without wall smudges over the registers, free from drafts and blowing air, and with every room . . . controlled to the exact temperature to suit our particular needs. We believe that those who are looking for the *cheapest* heat should choose one of the other types available, but for those who want the *best*, there is no alternative."

Several utilities in the state of Washington have reported gains in electric heating. Clark County PUD added 530 electrically heated homes during the first quarter of 1959. One in five homes there is now heated electrically, compared to 1 in 10 four years ago. Of new homes, 75% are using electric heat. Douglas County PUD has nearly a 30% saturation among its residential customers, and Lincoln Electric Co-op has a 35% saturation, double their 1956 percentage.

UTILITY CAMPAIGNS

West Penn Power Co is promoting electric dryers in September and October, to tie-in with Edison Electric Institute's Fall Electric Laundry Festival. Fourteen electric dryers, one per district, will be awarded to customers who register for a drawing. If the winners purchase an electric dryer between September 1 and October 31, full purchase price of the dryer will be refunded. Dealer awards will consist of 19 cash awards in each district, also to be chosen through a drawing. Promotional aids include: Ads, direct mail; newspaper advertising allowances, radio advertising and direct mail subsidies, and pocket cards outlining the promotion.

New Orleans Public Service Inc is holding a two-months food freezer-refrigerator-freezer campaign. Newspapers, TV, radio, outdoor billboards, direct mail, and window and floor displays will be used. Cash awards will go to high-selling salesmen. A Freezer Give-Away will also be held. Another NOPSI campaign is offering "Bonus Bulbs for better light." In cooperation with lamp bulb dealers, the utility is offering a special assortment of lamp bulbs at a reduced price. The package consists of four 100-w bulbs and a 150-w Bonus Bulb, packaged in a polyethelene bag.

Kansas Power & Light Co has launched a 5-month promotion in cooperation with territory dealers to boost sales of major electric appliances, especially ranges, water heaters and clothes dryers. Dealer salesmen will earn points for each sale, redeemable from an award catalog supplied by the utility. To interest salesmen's wives in the contest, a monthly drawing will be made from sales reports received during that month with a mink stole to the winner.

Florida Power & Light Co is pushing electric dishwashers and radios-TV-HI-Fi in two-month campaigns. Dishwashers will be promoted through September and audio and video will be emphasized through October. End of the year promotions will include water heating and ranges and table appliances.

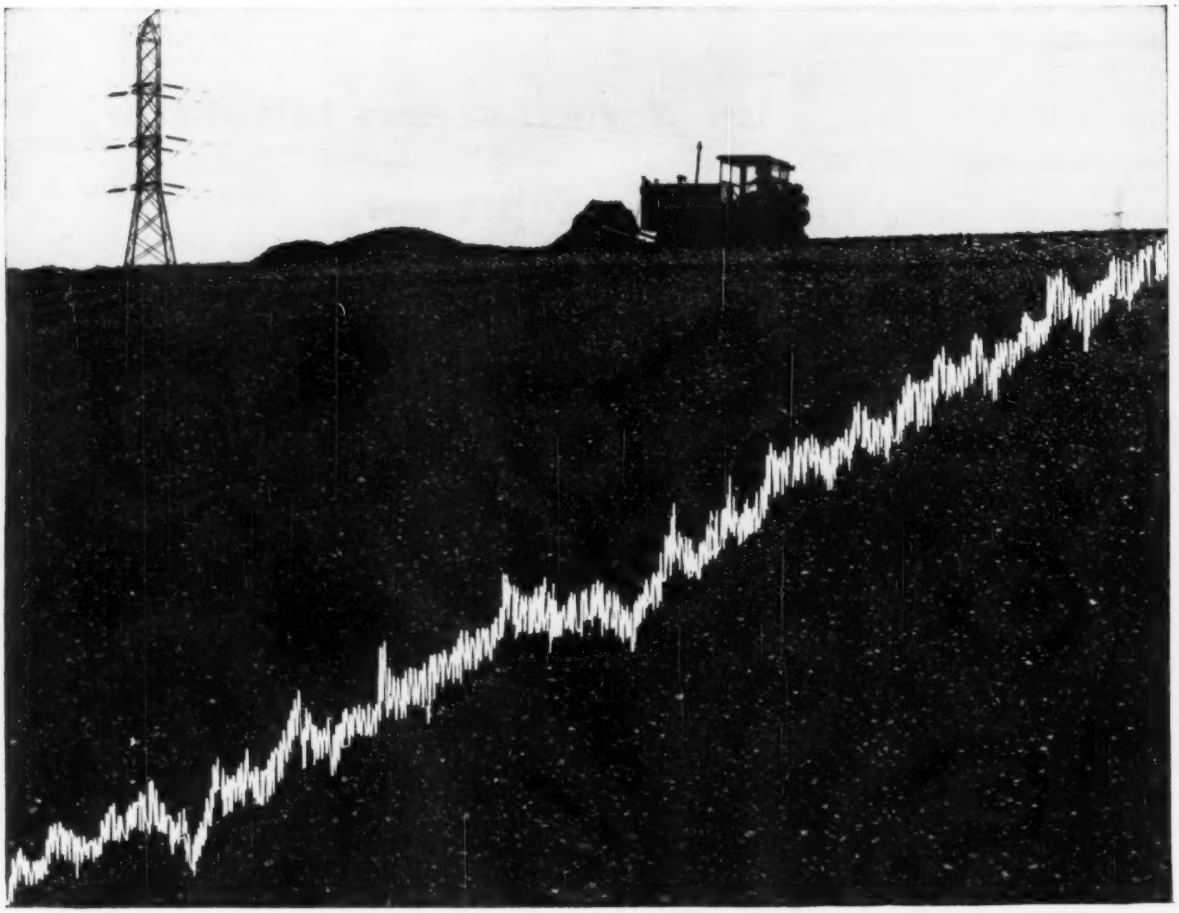
Right now . . .

MULTI-AMP is ready . . . to serve electric industry's growing needs with a standard line of portable and laboratory test equipment for protective devices . . . relays, circuit breakers, reclosers, etc. Whatever your requirements, we can design and supply your test equipment.

MULTI-AMP DIVISION
MULTI-AMP ELECTRONIC CORPORATION
465 E LEHIGH AVENUE UNION NEW JERSEY

powerful appetite!

As utilities *look* ahead and *build* ahead for a power demand in ten years double what it is today—continuity of supply and proven, available coal reserves are topmost subjects in discussions with their suppliers. A career coal company such as Island Creek with its vast reserves,* modern mining methods and scientific preparation facilities is in a position to come up with some very reassuring answers. We'd welcome an opportunity to do some looking ahead *with* you.



* *Island Creek's vast, proven, available reserves total more today than Island Creek has taken out of the earth in the past 50 years.*

You can depend on **ISLAND CREEK**

. . . a career company . . . dedicated to coal

Island Creek Coal Sales Company, Chafin Building, Huntington 18, West Va. • Cincinnati • Cleveland • Greensboro • Chicago • Detroit • New York • Pittsburgh

Report on
Executive
Compensation

'Though their compensation still trails the average . . .

Utility Execs' Pay Gained in '58

Compensation of public utility executives still lags the all-industry average, but there are indications that the gap is slowly narrowing. During the recession-year 1958, it narrowed substantially. Source of this information is a broad survey of top-management compensation in 23 industries completed recently by the management consulting firm of McKinsey & Co. For five years the firm has studied financial results and trends in compensation of a number of leading industries in the U. S. The overall findings of the latest survey have just been published by *Harvard Business Review* in a report by J. McLain Stewart of McKinsey & Co. Public utility data has been analyzed especially for *Electrical World* by Lawrence S. Munson, a principal of the consulting firm.

The survey for 1958 includes data from 791 companies in 23 major industries. The sample includes 39 public utility companies with average revenues of about $100 million a year. Here are some highlights of the survey:

- **Average compensation for utility chief executives was $82,000 in 1958**—some 18% below the all-industry average for top executives.

- **The "number-two man" in a public utility averaged about $55,000**—trailing his all-industry counterpart by about 24%.

- **Third and fourth highest-paid executives in utilities also trailed** the all-industry average. Utility companies in the sample paid the third man from the top an average of $41,000 and the fourth-ranking executive an average of $38,000. All-industry average compensations for the same positions were $59,500 and $54,500 respectively.

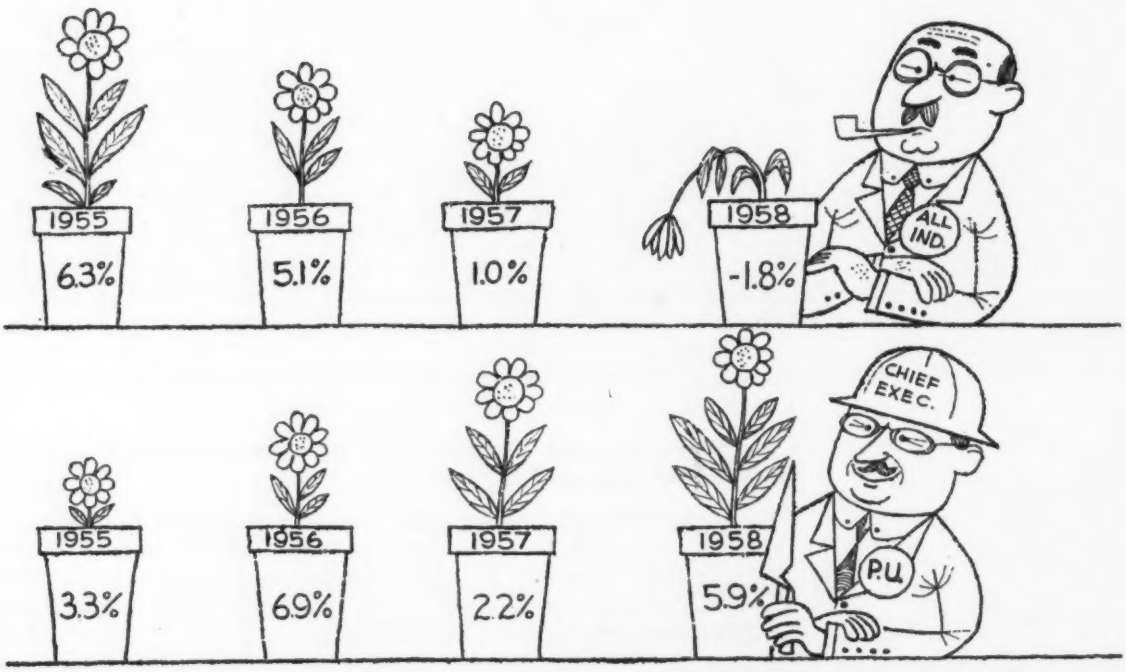
- **But utility compensation gained on the all-industry average in 1958.** Much of this "gain" was due to a loss of compensation in other industries which were

hit harder by the recession than were the utilities. However, some of the gain represents extension of a trend that has been going on since 1956.

The recession of 1958 caused the first decline in top-management compensation since McKinsey began its annual studies. According to the survey, all-industry average compensation of chief executives dropped by 1.8%. Specific industries ranged widely around this average, with 13 of the 23 industries studied showing declines in chief-executive compensation and ten showing increases. At the extremes, chief executives in the tobacco industry received an average increase of 8%, while industrial machinery manufacturers averaged an 8.7% cut.

Public utilities ranked third from the top in percentage increases in compensation for chief executives. The top men in the 39 utilities studied received an average compensation increase in 1958 of 5.9%. Within the utility industry, 23 of the 39 companies posted increases for the top-paid executive. Thirteen showed no change, while only three showed decreases. And in the three companies where the top executives' compensation declined, the decreases were all attributable to changes in status between chairman and president rather than to any overall downward pay adjustment. In each, the president's compensation rose at the same time the chairman's was declining. Quite probably this reflected a gradual changeover in chief executive responsibility.

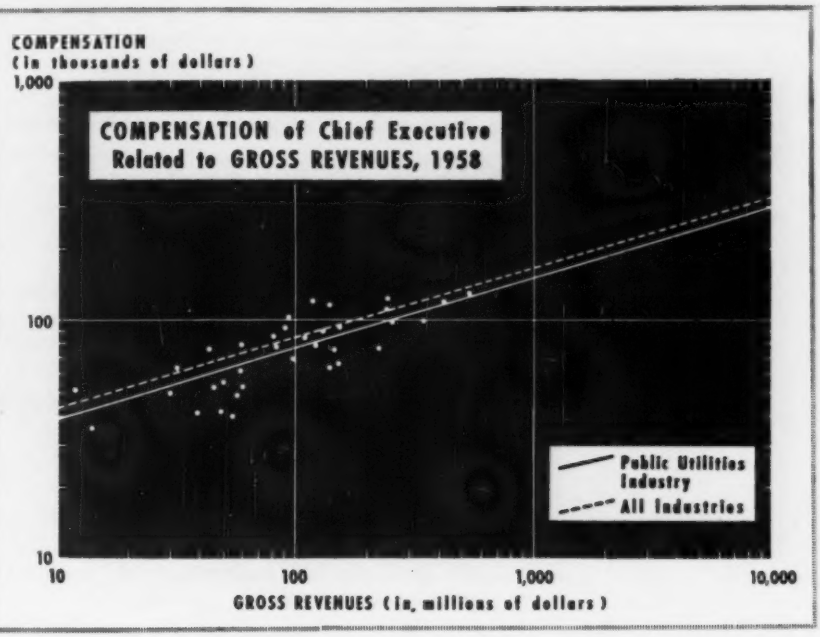
The rise in utility compensation seems to be more than a flash in the pan. The 1958 figures alone can't be taken as indicative of the trend, but results of the McKinsey surveys since 1956 show the compensation of utility executives gradually catching up with the all-industry average. In 1954 and 1955 the average compensation of chief executives in all industries studied rose faster than in the utilities included in the sample. Since 1956, however, the utilities have been closing the gap: In 1956, chief executive compensation rose 5.1% in all industry, and 6.9% in the utilities. In 1957 utilities showed a 2.2% rise vs. 1% overall. Recession-year 1958 gave utilities the biggest relative gain—5.9% against an average 1.8% decline of the all-industry average.



The Narrowing Gap between Utilities and Other Major Industries . . .

. . . in compensating their chief executives shows in the chart to the right. Solid line is the norm in public utilities; broken line is the all-industry average, per dollar of gross revenues.

Although the utilities still lag, recession-year 1958 saw them pick up a good gain on the pack.



The graph above shows the utilities' relationship to all industry in chief-executive compensation for 1958. The horizontal axis represents gross revenues, and the vertical axis represents 1958 compensation of the chief executive. Dots show the positions of individual utility companies, and the solid line represents the "line of best fit" for the 39 utilities studied. The broken line is the "line of best fit" for all industry.

The graph shows clearly that compensation for utility chief executives in the companies studied is still lower per sales dollar than the average of the all-industry sample. After accounting for normal sampling error, the difference is still a significant one statistically, though not as large as it has been in the past.

Most industries showed a relationship between compensation and profits. The utilities, for example, showed an average increase in net income of 7.9% while they increased chief-executive compensation by 5.9%. And the tobacco industry awarded its chief executives an average 8% increase at the same time company earnings were rising by 19.1%. But this close connection between profits and compensation did not hold true in all industries. In the petroleum and aircraft manufacturing industries, where profits declined by almost 20%, chief executive compensation rose by almost 4%. And chief executives in the air transport industry received only a 1% "raise" although industry profits went up by 31.8% —the best rise by an industry included in the sample.

Among industries whose profits declined in 1958, almost all reduced the compensation of the chief executive. But the relationship was not quantitative. In the automotive parts industry, a 38.7% drop in profits resulted in a 5.3% average cut in chief-executive compensation, while the top man in the consumer metal products industry took a 5.8% cut on a 5.4% decline in industry profits.

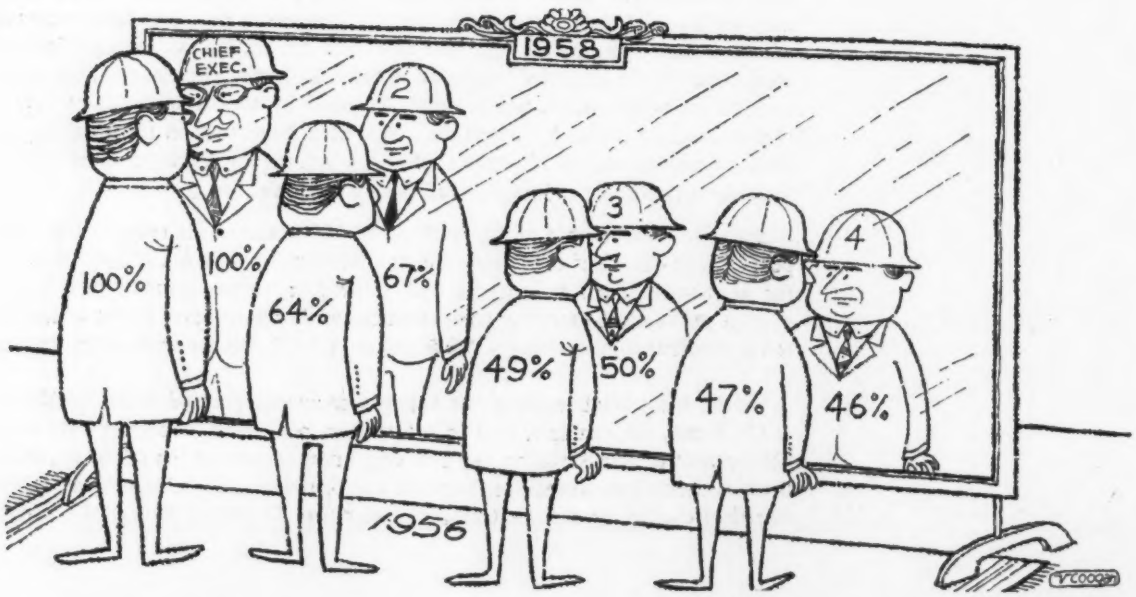
A similar loose relationship exists between compensation and sales. McKinsey & Co found, for example, that in the rubber, petroleum, and steel industries, chief-executive compensation depends very much on size of the company, while there is much less correlation between compensation and sales volume in the electrical equipment and air transport industries. Utilities fall near the middle

of the scale. Size of the company accounts for about 60% of the variation in utility chief-executive compensation, while the other 40% stems from other factors.

None of the 39 utilities in the sample reported incentive compensation in their plans, in contrast to many of the other industries. All of the 39 provided pension plans in addition to cash compensation, and a few offered life insurance or other contractual benefits. The study noted very little change in the structure of utilities' executive compensation plans.

The same general trends show in compensation of other high executives in utility companies, but the spread is wider in the utilities than in the average of all industry. Measured against the chief executive's compensation, the number-two man in the utilities studied earned 67% as much as the chief in 1958. The all-industry average shows that the number-two executive earned 73% as much as the chief executive earned.

In all industry, the other high executives have gained on the chief executive since 1956. In the utilities, the number-two and -three men have gained on the chief, while the number-four man has slipped slightly in his relationship to the chief executive's compensation. In the utilities studied, the number-two man's compensation has risen from 64% of the chief executive's compensation in 1956 to 67% in 1958. In all industry, the second-highest paid executive has made about the same relative gain (from 70% in 1956 to 73% in 1958); but this is illusory since the compensation of the chief executive scored a good rise in the utilities, while it showed a net decline over the two-year period for all industry. The third-highest-paid executive also gained on the top man, both in the utilities and in all industry. In utilities, his compensation averaged 49% of the chief executive's in 1956 and 50% in 1958. In all industry, the percentage gain was greater—from 57% to 60%. The fourth-highest-paid executive in the utilities earned only 46% of the chief executive's compensation in 1958, after having earned 47% in 1956. Over the same period, the number four man in the all-industry average has increased his percentage of the chief executive's compensation from 51% to 55%. In dollars, however, the number four man in the utilities has received approximately the same increase as his all-industry counterpart over the period.



DEAN H. MITCHELL STATION NORTHERN INDIANA PUBLIC SERVICE COMPANY *414,300 kw—3 Units*

Power in Northern Indiana . . .

Abundant water supply and highly favorable transportation facilities have been important factors in the amazing development of heavy industry in the Northern Indiana area. Its steel production and oil refining are a major element in the American economy. Northern Indiana Public Service Company has played an important role in this growth and is gearing itself to meet the even larger future of this industrial concentration. When the completion of the great St. Lawrence Seaway project stimulates a new flow of trade into the Middle West, Northern Indiana will experience a further expansion in industry, commerce and population. The new Dean H. Mitchell Station represents a big step in the company's program to provide adequate electrical facilities for the load to come.

FULL COLOR BROCHURE outlining the scope of Sargent & Lundy services will be sent on request.

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ENGINEERS

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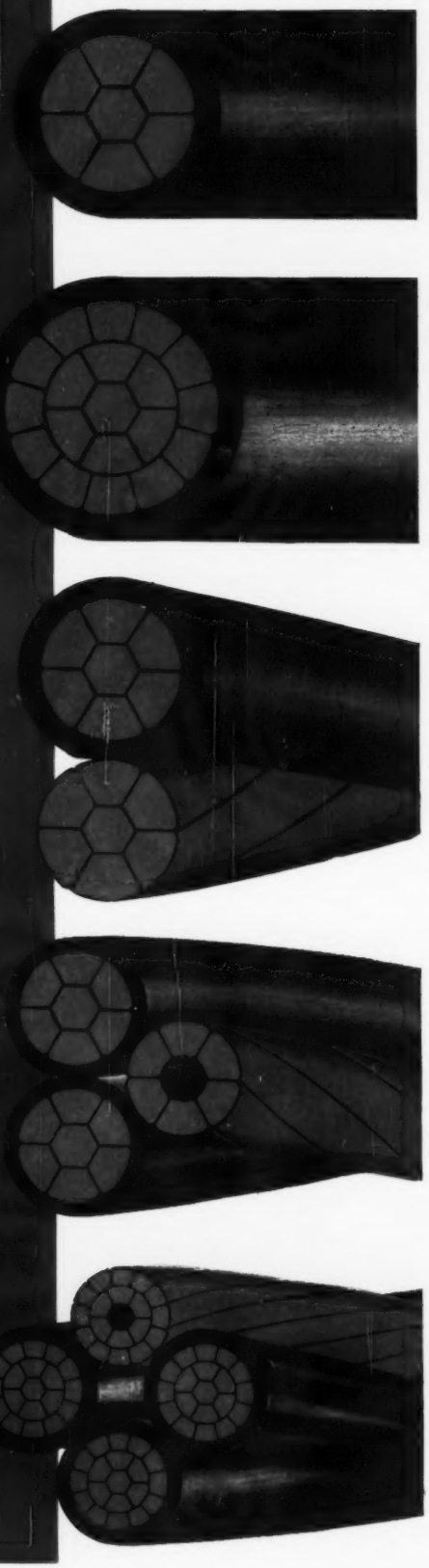
SOUTHERN ELECTRICAL'S GROWING FAMILY OF

Compresto® Cables



From Southern Electrical Company's engineering laboratories, which developed "COMPRESTO" cable for the electrical utility industry, comes a NEW member to the "COMPRESTO" family, **19 WIRE COMPRESTO.**

NOW AVAILABLE — IN COMPRESTO

19 wire All aluminum conductors — sizes up through 336, 400 CM

18/1 ACSR Conductors — sizes up through 336, 400 CM

Available with,
NEOPRENE, POLYETHYLENE or TWO COAT INSULATIONS

Available as,
COVERED LINE WIRE, DUPLEX, TRIPLEX and QUADRUPLEX

Developed for the growing need of secondary service cables.

Southern Electrical Company

CHATTANOOGA, TENNESSEE

Training Program Pays Off (*Continued from page 96*)

crew members differed in one respect: Instead of complete system drawings, they were given drawings indicating the equipment only.

After studying large drawings or lantern slides, trainees traced the systems in the plant and drew in the lines themselves. Then they returned to the class room and checked their drawings against the master. This procedure caused each man to review each system at least three or four times, becoming thoroughly familiar with the components.

Training aids consisted of 27 x 40-in. black-and-white drawings, lantern slides, and mock ups. In addition, some manufacturers supplied large colored drawings, 35-mm slides, and lantern slides.

Black-and-white drawings of complex systems, such as demineralizer and combustion controls, were colored with pencils to point out the different phases. Also, cut outs of different selector valves were made to show details and the procedure used to change from manual to automatic control.

Preparation of the training aids required considerable trial-and-error testing before the final product was completely satisfactory. For instance, to make about 100 lantern slides, the company first prepared 27 x 40-in. ink tracings. These were sent to a commercial photographer who made 8½ x 11-in. negatives and lantern slides. The negatives were then printed by the company for the training manual. Cost of making both the negatives and lantern slides by this method was $7.50.

Cut Cost of Training Aids

After preparing about ten slides and prints in this way, Tampa Electric found that it could make lantern slides and 8½ x 11-in. masters using its dry, electrical copying process provided the ink tracing was limited to 17 x 22-in. Using this method, the cost of both the lantern slide and master was about $1.00.

Standards were established for the minimum lettering and line sizes to be used on drawings to assure that the lantern slides would be legible. To develop these standards, the company prepared 27 x 40, 17 x 22, 8½ x 11, and 3 x 4-in. tracings using various line and lettering sizes on each. Lantern slides made from each tracing were projected onto a standard screen to establish the minimum line and lettering sizes.

The operating crew for the first unit at Gannon Station requires one head watch engineer or shift supervisor, one watch engineer, one control-room operator, and three auxiliary operators. Since Tampa Electric maintains four shifts, 24 men were needed to operate the plant. An extra head watch engineer and an auxiliary operator were added to provide vacation and sick-time relief.

Half of Crew Promoted from Within

To follow the policy of promoting from within meant that at least half of the 26 men would have to come from existing stations. These operators and the 13 new men (auxiliary operators) received some training in an existing station before being sent to the new station.

Under an agreement with the union, existing personnel were advanced to the next higher classification for a definite period and then returned to their regular jobs. Auxiliary operators were trained as firemen for 3 months. Firemen trained as switchboard operators for 6 months. Switchboard operators trained varying periods as watch engineers.

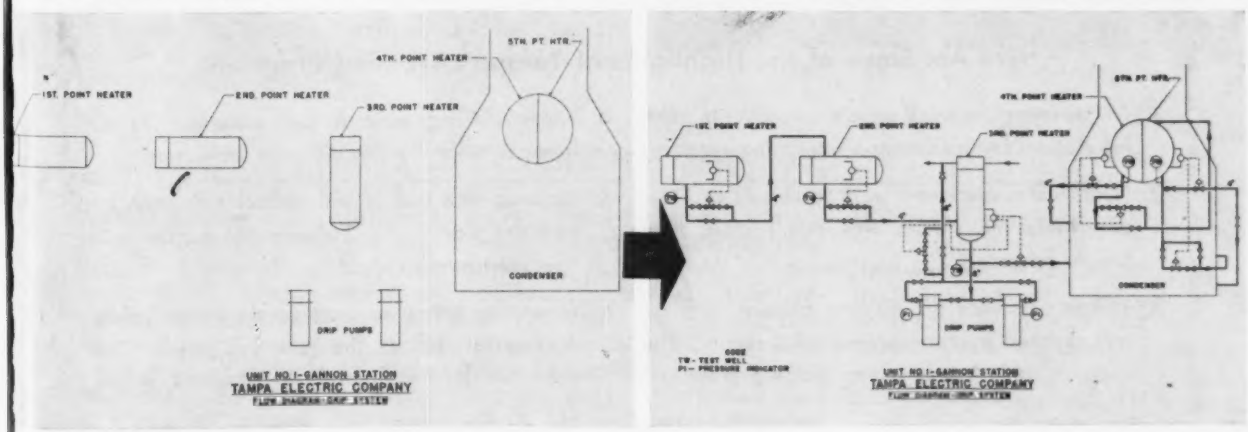
To make possible these temporary advancements, three or four auxiliary operators were hired and trained one month before advancing senior men. Hiring of new men every 3 or 4 months prevented serious overburdening of the crews in the two training stations. Men temporarily displaced by trainees were used as extra help for performing maintenance, provided relief for vacations, and filled in as instructors.

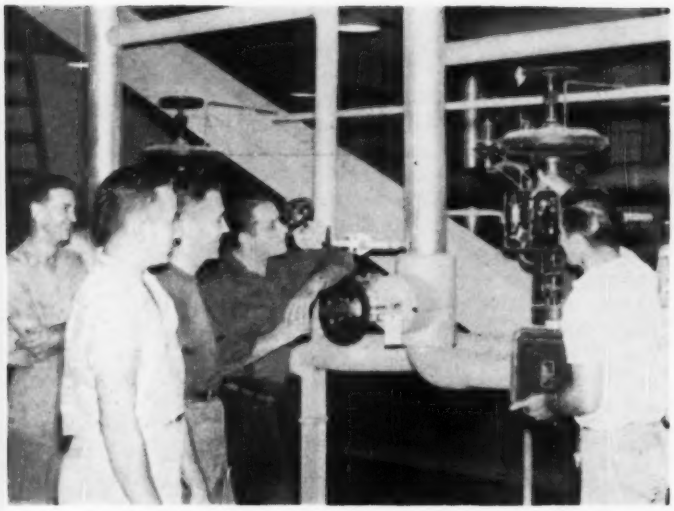
To check the progress of trainees, the plant chief and asst-chief engineers periodically interviewed new

(*Continued on next page*)

BEFORE class, trainees got drawings showing only equipment. They added flow lines while touring plant

AFTER having filled in the flow lines at the plant, the trainees returned to the classroom to check accuracy of their work





TRAINEES got a personal introduction to all equipment

men and talked with all trainees' immediate supervisors.

This preliminary training was fairly smooth and very beneficial. It permitted transfer of men to the new station without seriously weakening operating crews at other stations.

Training Divided into Three Phases

Training at the new station was divided into three phases: Instructor training of 2 months, crew training of 6 weeks, and crew coordination of 6 weeks. Class schedules for each phase were prepared by Production Dept engineers and the plant chief and asst-chief engineers. They also listed the materials and training aids required for each day and set up a temporary library of instruction books, blueprints, etc.

These engineers taught the four head watch engineers who later instructed the crew. Special emphasis was placed on the responsibilities of head watch engineers as instructors and coordinators and the opportunity they had to get to know their men and develop team coordination. Then the program was explained.

Each subject was presented during a short classroom session utilizing training aids, followed by a brief tour of the subject in the plant, and finally a discussion period. This procedure was successful because it allowed trainees to touch the equipment, and broke up the training sessions into small segments.

Many Suggestions Went into Station Design

Questions and suggestions for improving the plant were encouraged. Questions came by the dozens, and instructors were pressed to provide satisfactory answers. Many excellent suggestions were included in the station. This gave the men a feeling of having a part in the design, helping their pride and morale.

After each section of the manual was covered, it was reviewed; and a 7-day general review of the whole manual was held. During review sessions the instructor-trainees alternated as instructors to gain confidence and experience for the crew training sessions.

The last three days of the head watch engineers' training were devoted to developing startup procedures in a conference with the chief and asst-chief engineers. Manufacturers' instruction books and operator experience were used in making up comprehensive procedures for the turbine, boiler, and main auxiliaries. As service engineers arrived, the procedures were discussed and revised.

The other 20 operators were divided into two groups. Each group was assigned two head watch engineers who instructed for 3 weeks. After the entire training manual was presented, the instructors changed classes; and the program was repeated. In this way trainees were exposed to the material at least twice, and four head watch engineers became acquainted with all trainees. Frequent review sessions were held.

At the end of crew training, four operating crews were formed. During the remaining 6 weeks before clean-up and testing of equipment, the head watch engineers presented hypothetical problems to test the operators. A mock-up of the control bench-board and recorder board was used during these sessions. Crews practiced startup and shutdown procedures for most equipment. By performing these procedures as a team, duties for each man were standardized.

Here Are Some of the Highlights of Tampa's Training Program

1. All personnel received advance training in existing stations before Gannon went into operation.
2. Head watch engineers went to classes at Gannon while the station was being built, then taught operators.
3. Tampa prepared the training manual, with all text checked by two engineers for clarity. The company also made its own training aids.
4. Entire training manual was presented to all trainees twice, by two different instructors.
5. Training was tied in with actual operation by frequent plant tours. Trainees got a chance to "get their hands dirty."
6. Operating crews were set up six weeks before starting to operate the new equipment. This enhanced teamwork and standardized duties.

KRAUSE

JOSLIN

JONES

NEES Names New VPs, Other Officers

Robert F. Krause has become a vice president of the New England Electric System. Frank R. Joslin and C. W. Jones have been named vice presidents of the New England Power Service Co, wholesale subsidiary of NEES.

Other appointments include: Clifford Hartley, construction manager, of the subsidiary, and R. Leigh Fitzgerald, assistant to the president of NEES. Irwin L. Moore, chairman of NEES, resumes the presidency of New England Power Co.

Krause was the former president of NEPCO. He joined the corporate department of NEES in 1948 and was named assistant to the president in 1950. In his new position he will be responsible in the general area of management for retail operations of gas and electric companies. He succeeds R. E. Nock who is retiring.

Joslin was the former construction manager of the Power Co. He is succeeded by Clifford Hartley.

Jones will become the new engineering and operating head of New England Power Service.

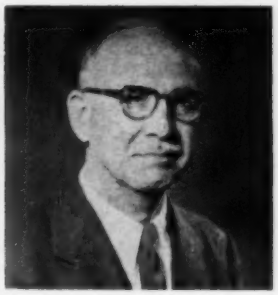
Lee Elected Burndy President

Marvin Lee has been elected president of Burndy Corp. He succeeds Bern Dibner who was elected chairman of the board of directors.

Lee, who was formerly executive vice president of Burndy, joined the company in 1924, became a director in 1925, chief engineer, in 1935, and executive vice president in 1947.

Dibner who founded Burndy, is also president and founder of Burndy Library and chairman of the Electrical Historical Foundation.

LEE



DIBNER

PERSONAL BRIEFS

Alex McKeigney joined Mississippi Power & Light Co as administrative assistant in the executive department. Gerry Bishop, named assistant training director personnel.

Duke Power Co promoted **Alpha M. Neely** to manager in its Tryon, N. C., office.

Jersey Central Power & Light Co named **Leonard J. Kalechitz** chief dispatcher at Whippany, a new operation center. Both Jersey Central Power & Light Co and New Jersey Power & Light Co appointed **Edward J. Foran, Jr,** assistant rights-of-way manager. Also named **Russell W. Aul** secretary and **Raymond D. MacFee** comptroller.

Pacific Power & Light Co named **Dr James B. Ward** director of the newly-created research department managing its technical and scientific investigations. Engineers and scientists on the staff include **Dr J. A.**

(*Continued on p* 174)

DID MACY'S TELL GIMBELS

about those wonderful MARCUS transformers

We don't know . . . but both of these nationally famous department stores use Marcus Transformers for power and lighting distribution.

Marcus "Mark of Quality" transformers GUARANTEE trouble-free service and safe, dependable operation. For bigger profits and greater customer satisfaction, use MARCUS for your next installation.

MARCUS
TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY

Representatives in Principal Cities

"Mark of Quality"

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

Courtesy of Union Carbide Plastics Company, Division of Union Carbide Corporation.

Illustrated is one of the eighteen MURCO Gate Hoists on the Long Sault Dam shown above. Each hoist weighs 93,000 lbs. . . . has 175 tons lifting capacity . . . will raise and lower the gates in the dam at a speed of 1 foot per minute. The overall length of each unit is 57 feet . . . 8½ feet wide and 12½ feet high. Write for complete information and Engineering Department recommendations.

. . . to control water level at Long Sault Dam, St. Lawrence Power Project

MURCO GATE HOISTS

For the second largest hydroelectric power plant in the United States at Massena, New York—as part of the St. Lawrence power project—Uhl, Hall & Rich, project engineers, selected MURCO Gate Hoists to control the water level at Long Sault Dam. MURCO Gate Hoists are designed from knowledge and experience . . . backed by over 75 years in design and manufacture . . . made for any size power dam . . . capacities from less than 1 ton to over 100 tons . . . from the smallest hand operated to the largest motor operated gate hoist, all made to specifications.

Manufacturers Since 1883

D. J. MURRAY MANUFACTURING CO.
WAUSAU, WISCONSIN

(*Continued from Page* 173)

R. Hamilton, Garth Duell, and **Norvin W. Richards.**

John H. VanGorkom joined the rate department of Ebasco Services, Inc.

George B. Campbell, who was formerly assistant to the president of Southern Services, Inc, has been assigned to full-time duties in The Southern Co's financing and budgetary operations as assistant secretary and assistant treasurer.

Ralph E. Colwell, senior power sales engineer at Appalachian Power Co's Roanoke office, has been promoted to the American Electric Power Service Corporation in New York City in charge of the technical service group in the Air-Conditioning Division. **S. N. Fiala,** vice president and chief engineer of American Electric Power Service Corporation, has been elected a director of Kentucky Power Co.

Allyn W. Falls, management consultant, joined the San Francisco office of Ebasco Services, Inc.

Union Electric Co promoted **W. Howard Hunsicker** sales supervisor in its St. Charles district. **Howard A. Daley** was made director of the sales department's display section succeeding **Paul W. Kloeris** retired.

Central Maine Power Co made the following staff changes: **Donald C. Kilgour** to Rockland manager replacing **Lucius E. Jones,** retired; **David Y. Holden** to assistant manager Rumford district succeeding **Hector A. Thibeault; John J. Morton** to manager Pittsfield district replacing **Reuel B. Soule,** who has retired.

The American Institute of Electrical Engineers raised **R. L. Pulley,** vice president of Gulf Power Co, to the grade of Fellow.

West Penn Power Co promoted **James W. Geiser** to assistant manager of research and development.

Dr Gordon S. Brown, head of the electrical engineering department of the Massachusetts Institute of Technology, Cambridge, has been appointed dean of the M.I.T. school

of engineering, succeeding Dean **R. C. Soderberg,** now named Institute professor.

Clifford Winner, treasurer, and **Arthur C. Guest,** assistant treasurer, of Philadelphia Electric Co retired recently.

Cleveland Electric Illuminating Co named **Karl H. Rudolph** controller succeeding **Ralph H. Smith** who retired.

Joseph E. Kopp has been named assistant vice president of General Cable Corp.

Babcock & Wilcox Co announced these personnel changes: **Ralph K. Behr** to manager of the New York district sales office, succeeding **Nicholas J. Connor** who becomes a sales consultant; **Robert A. Barr** to general manager of the Refractories Division; **George W. Kross, Jr,** to assistant manager of tubing operations at the Tubular Products Division, Beaver Falls, Pa., and **G. E. Pletz** succeeds Kross as superintendent of the division's Keystone Street plant in Alliance, Ohio.

David L. Scott named plant manager of the Miamisburg facilities of the Monsanto Chemical Co.

Ohio Gov M. V. Di Salle named Democrat **Edward J. Kenealy** chairman of the Public Utilities Commission, replacing Republican **Everett Krueger, Jr.,** who remains a member.

Robert A. Lewis has been appointed advertising manager of the Rome Cable Division of the Aluminum Co of America.

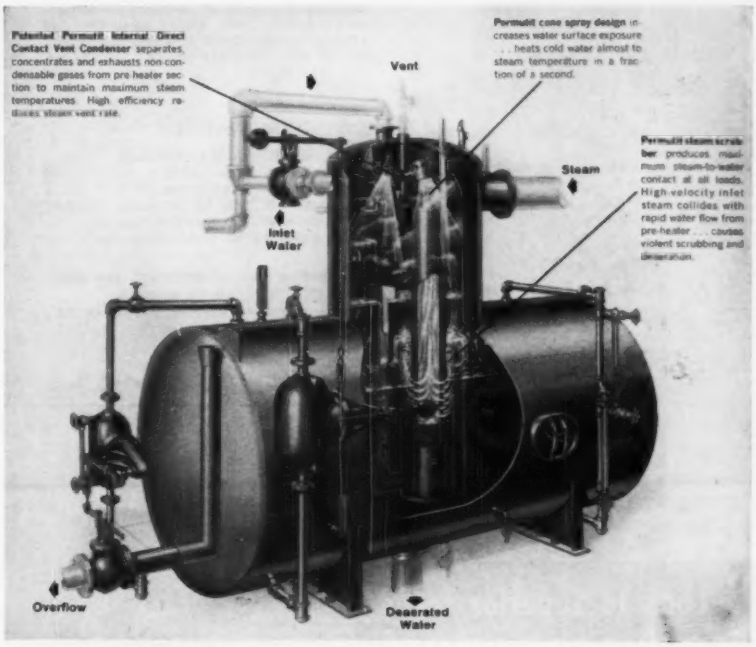
Rural Electrification Administration has appointed **Milton A. Chase** to the new position of special assistant-power planning in the office of Assistant Administrator Roy G. Zook.

B. J. Martin Co, Inc, publisher of Electrified Industry and Today's Business magazines, announced the election of **David M. Charleson** as vice president-advertising sales, and **William A. Vinnedge** vice president-editorial operations.

Sargent & Lundy has given full departmental status to its nuclear ac-

FLUIDICS

is a Pfaudler Permutit program providing
the know-how
the equipment
and the experience
for solving problems involving fluids.


Patented Permutit Internal Direct Contact Vent Condenser separates, concentrates and exhausts non-condensable gases from pre-heater section to maintain maximum steam temperatures. High efficiency reduces steam vent rate.
Vent
Permutit cone spray design increases water surface exposure . . . heats cold water almost to steam temperature in a fraction of a second.
Steam
Permutit steam scrubber produces maximum steam-to-water contact at all loads. High-velocity inlet steam collides with rapid water flow from pre-heater . . . causes violent scrubbing and deaeration.
Inlet Water
Overflow
Deaerated Water

FLUIDICS AT WORK

New deaerators guarantee less than 0.005 ml/l oxygen at all loads

This is the new Permutit Type B Deaerator. Both horizontal and vertical designs hold oxygen to 0.005 ml/l at all loads up to a peak of 150,000 lbs/hr.

No trays to be removed or cleaned. Tubeless internal vent condenser eliminates tube cleaning, also.

30,000, 50,000, and 70,000-lbs/hr horizontal units are available from stock. They come as packaged units with all internals, including sprays, completely assembled. Pre-fitted float-cage and gauge-glass piping further simplify installation.

Capacities from 150,000 to as much as 3,000,000 lbs/hr are available in Permutit Type A Deaerators.

For more information, write to our Permutit Division, Dept. EW-99, 50 West 44th St., New York 36, N.Y.

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Whenever you have a fluid-handling problem, look to this Pfaudler Permutit FLUIDICS program for the best solution.

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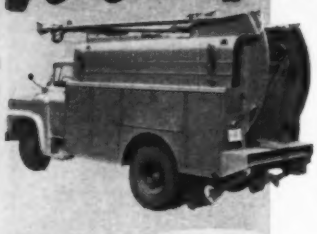
Specialists in FLUIDICS . . . the science of fluid processes

Koenig ALL-STEEL UTILITY BODIES



LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

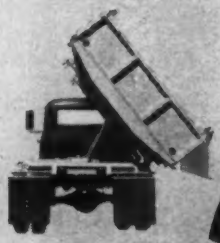
SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

3-WAY DUMP BODIES

DUMP to the RIGHT, LEFT and REAR

All-steel welded bodies available in 8' to 11' lengths. The multistage telescopic hoist has a lifting capacity of 25,000 lbs. This is the ideal body for safe dumping under hazardous conditions . . . especially adaptable for windrowing and backfilling.



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tivities. It has named **Fred W. McCloska** to head the department.

Valley Engineering Co, Glenside, Pa., announced that **M. Bukowitz** has joined the organization as chief project engineer.

Philco Corp has made these personnel changes: **L. G. Becker** to eastern regional manager for the Government & Industrial Division; **William Doherty** to sales manager for Transac computers; **Robert E. Steele** to manager of product planning for Transac computers; **Norman O. Bender, Jr,** to the newly-created position of operations manager for Transac computers; **Robert A. Cohen** to the newly-created position of manager-customer information services for the computer department; **George M. Rouzee** to the newly-created position of sales manager for the Government & Industrial Division's western development laboratories, and **Kenneth J. Evans** to replace Rouzee as government sales manager for advanced military systems.

Pennsylvania Transformer Division, McGraw-Edison Co announced a new department for the manufacture of secondary unit substation and switchgear. Product manager is **J. J. Zimsky,** formerly head of Pennsylvania Transformer's planning department. Sales manager for the department is **T. S. Banghart.**

Carl Pehlke named assistant to the manager of the microwave department for Motorola's Communications and Industrial Electronics Division.

These three personnel changes have been made by Minneapolis-Honeywell Regulator Co: **William F. Newbold** to director of research for the Brown Instruments Division, succeeding **Walter P. Mills** who has been named technical advisor to the director of engineering, and **Kimball C. Cummings** to manager of engineering of the company's Beltville, Md., division.

Appointment of **Richard F. Woelfel** as government department supervisor, electrical products group, has been announced by Minnesota Mining & Manufacturing Co.

Supplies Division of International Business Machines Corp appointed **James F. Manning** as director of marketing and **Robert R. Stone** as controller.

Philip Coddington, general manager of the Carpenter Steel Co's Alloy Tube Division, Union, N. J., retired but has been retained as a part-time consultant to the company.

Westinghouse Electric International Co has made these appointments: **W. R. Terry** to manager of purchasing; **H. N. Horst** to regional representative for lamps at Manila, Philippine Republic, and **R. O. Heinemann** to regional director in the Middle East with offices in Beirut, and Lebanon.

Lawrence M. Lyons named production manager of the Utility Industrial Division of Burndy Corp.

These organizational changes have been made by the General Electric Co recently: **Gail B. Hamilton, Jr,** to manager of market development for heaters and devices; **Henry C. Nelson** to superintendent of the Anaheim, Calif., plant; **G. Stanley Sherland** to turbine application engineer for the firm's Pacific Northwest District; **Harold Weiss** to newly-established position of manager of applications engineering in the company's computer department; **David A. Yates** to manager of sales planning for the industrial commercial section of the apparatus sales division; **Richard H. Graham** to the new post of consultant-product planning at the firm's atomic power equipment department; **Dale L. Bunday** to national product planning manager for two-way radio equipment engineered by GE communication products department in Lynchburg, Va.; **Adam MacKenzie** to marketing manager of the lamp metals and components department in Cleveland, Ohio; **Louis J. Balint** to product engineer on electrically fused magnesium oxide for the company's chemical materials department at Pittsfield, Mass.; **John F. Simons** to manager-relations and utilities at Appliance Park in Louisville, Ky.; **John M. Butler, Jr.,** to sales manager at small AC motor and generator department, Schenectady, N. Y.

I wish we had more time and personnel to prepare for this rate case!

Your staff is overloaded now. Call in the specialists and let them carry the peak load. HOW ABOUT PIONEER?

GIVE YOUR NON-ROUTINE OPERATIONS TO PIONEER

Design and Consulting Engineering Services

Pioneer has specialized in designing power plants for 57 years. It designs fossil fuel, hydro and atomic plants. It forecasts load growth, selects sites, purchases and expedites equipment and supervises construction. Pioneer's other services include substation, transmission and distribution studies and design.

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Pioneer offers services in all phases of Federal, State and Local regulation including rate base, depreciation analysis, cost of service studies, market analysis, certificate proceedings and rate of return.

Corporate Services

Pioneer's services in corporate matters include business and management engineering advice, financial, accounting, tax counsel, insurance, and pension planning. It maintains a complete stock transfer, ledger and dividend disbursement service.

NEW!

On your letterhead, write for 40-page booklet, "Pioneering New Horizons in Power". Describes, illustrates Pioneer's engineering services, and corporate services, from financing to operation.

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Galvanized

STEEL

for the

ELECTRICAL INDUSTRY

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DETAILED
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TULSA, OKLA. MEMPHIS, TENN.

Sylvania-Corning Nuclear Corp has made these recent appointments: **John M. Zabkar** to head manufacturing operations; **Richard A. Alto** to supervisor of the production control section; **Harold R. Diot** to project manager in charge of all aluminum fuel element projects; **John R. Dickson** to head the commercial planning and control department; **William C. Herman** to quality control engineer; **H. Robert Clayton, Jr,** to head the quality control department; **Charles S. Fee** to project manager in charge of ceramic fuels contracts; **B. H. Francis** to project manager for PRDC reactor fuel production, generally known as the Enrico Fermi Fast Breeder Reactor at Detroit; **William G. Lidman** to project manager in charge of coordinating all activities bearing on the Army Package Power Reactor.

J. W. Cunningham named manager of the Bailey Meter Co's Atlanta district office.

Appointment of **John R. Bossenga** as assistant to the chief engineer and the promotion of **Ernie C. Rangus** to production and tooling engineer and **Gediminas Bubelis** to chief draftsman, all in the engineering department of Speedway Manufacturing Division of Thor Tool Co, have been announced.

R. R. Forbes has been appointed sales manager of the Elkon Division of P. R. Mallory & Co.

Anaconda Co elevated **John M. Hoffman** to the newly-created post of mining manager.

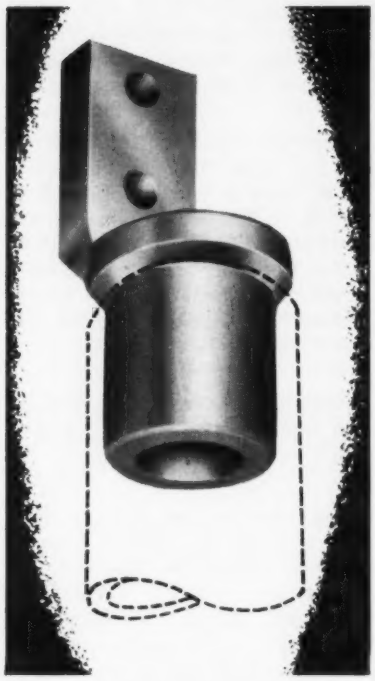
Harry T. Silverman has been elected president of Landers, Frary & Clark, succeeding **Bret C. Neece** who has become board chairman.

Oliver Electrical Manufacturing Co named **Thomas C. MacCalla, Jr,** chief engineer.

Pierce G. Fredericks, commercial vice president of Federal Pacific Electric Co, has retired.

Harold T. Hulett appointed general manager of Hotpoint's kitchen appliance department, succeeding **E. M. Haines,** who has accepted another position within the General Electric Co.

WELDING FITTINGS



ROYAL'S ALUMINUM WELDING FITTINGS PROVIDE *INTERNAL* SUPPORT

Royal's *internal support* feature reinforces the conductor beyond the heat affected zone providing ample reinforcement to more than make up for the loss in strength due to welding.

With this design, Royal weld fittings furnish *greater strength* at the weld area. This means a low shearing and bending stress in the welded zone.

Look to Royal for these high quality characteristics in Aluminum Welding Fittings . . . Prevent loss of strength due to annealing. Prevent moisture penetration. Minimize corona.

Send for this important free handbook of Royal Aluminum Welding Fittings.

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Designers and Manufacturers of
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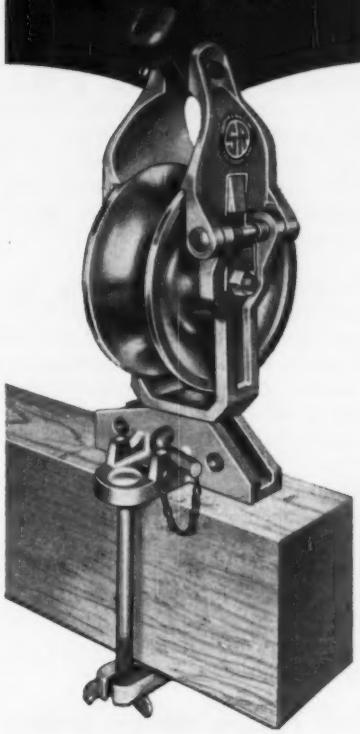
S&R Universal Stringing Sheave
MODEL XS-100



USE on CROSSARM as shown

USE on ANGLE for cornering block

USE without BRACKET to suspend from insulator stringing

Light weight, adjustable bracket, tough aluminum alloy throughout, safety locking, wide throat and anti-friction bearings. Grooved for cable through 1¾" diameter. Designed especially for ACSR.

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SALES ASSIGNMENTS

COMPANY STAFFS

Bailey Meter Co has moved its Pittsburgh district office to 875 Greentree Road, Pittsburgh 20. H. R. Fulton is the district manager. R. T. Keller, Bailey resident engineer in Jacksonville, Fla., has moved into an office at 1143 Mary Street, Jacksonville 7, Fla.

Okonite Co has named James F. Angle district manager of the newly created Salt Lake City district office in the Surety Life Building, 1935 South Main Street.

Metals Division of the H. M. Harper Co appointed Donald S. Eddy as sales representative.

Clark Bros. Co has appointed Ernest G. Hotze as Southwest district manager.

P. R. Mallory & Co, Inc, has named R. H. Andrew manager of field sales for the Capacitor Division.

Graybar Electric Co, Inc, has appointed W. A. Mueller as manager, appliance sales at Denver, Colo.

Clark Controller Co has made these sales changes: Vincent E. Hart has been transferred to the Cleveland sales office. Jack C. Awbrey has been promoted to application engineer in the Philadelphia district. William J. Backus has also been promoted to manager of the Cincinnati district office. Bruce C. Harmon has been made manager of the Akron branch office.

Mobile Drilling, Inc, has named H. E. Davis district sales and service representative for 19 western states. He will work out of the Denver, Colo., office.

Electro-Motive Division of General Motors has made these organizational changes: In the eastern region, R. B. Johnstone to manager utility equipment sales; J. P. Greenip to district manager-utility district, and J. G. Cronin and M. C. Warren to district manager—utility district. In the Chicago region, F. E. Von Ohlen to manager utility equipment sales; H. E. Mann and D. R. Eichler

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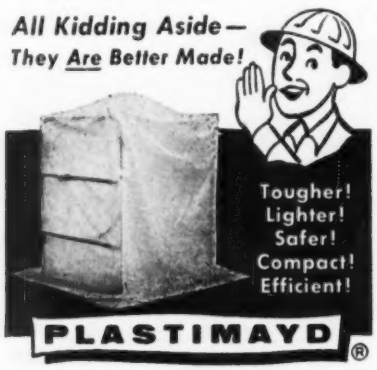

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HA-1

to district managers—utility district. In the St. Louis region, G. C. Mulick and A. M. Hazell, Jr, to district managers—utility district.

Kaiser Aluminum & Chemical Sales, Inc, has appointed Raymond F. Becker to the post of conduit sales manager.

Clark Bros. Co named Z. B. Deer, Jr, as sales engineer in the Texas-Oklahoma Panhandle area. His territory will cover northern half of New Mexico, the Oklahoma and Texas Panhandles plus the liberal Kansas area.

Westinghouse Electric Corp appointed Robert N. May sales manager of major appliances for the Los Angeles district. His headquarters will be at the Los Angeles district office, 4601 S. Boyle Ave., Vernon, Calif.

Moloney Electric Co announced the appointments of Robert T. Martin, and L. R. (Dick) Hurley to the national district sales staff. Martin has joined the company as assistant to the manager of the Dallas, Tex., district office, and Hurley district manager of Narberth, Pa., office.

Yale Materials Handling Division, Yale & Towne Manufacturing Co, named J. J. Curry midwest regional sales manager. His area will cover the states of Michigan, Ohio, Indiana, and Kentucky.

I-T-E Circuit Breaker Co appointed John J. Sedlacek manager of the Philadelphia district office. He will be responsible for sales of I-T-E electrical products in the territory consisting of eastern Pennsylvania, southern New Jersey, Delaware, eastern Maryland, and part of Virginia.

I-T-E Circuit Breaker Co opened two new southern district offices, one in Memphis, the other in New Orleans. William L. Anderson will be district manager at Memphis. He will be located at 219 Adams Ave. The office will serve the Arkansas, northern Mississippi, and western Tennessee area. Joseph T. Bauer will head the New Orleans office at 1500 Carondelet St. This office will serve the southern Louisiana area.

LETTERS

(*Continued from page 5*)

Perforations, please! This page and another one tore when I tried to remove them.

S. E. Steinbrook
Baldwin-Lima-Hamilton Corp
Philadelphia, Pa.

No! I prefer the perforations which work much better.

L. J. Hollander
New York University

Either way is OK with me.

C. H. Frier
Utilities Commission
Monroe, La.

It's OK with me as long as the librarians are happy!

E. E. Grayman
Cleveland Electric Illuminating

This beats the perforation method by a mile.

J. T. Kelly
Linwood, N. J.

. . . a great improvement over the perforations.

Charles D. Lehman
Greeley and Hansen Engineers
Chicago, Ill.

One big disadvantage: The whole magazine is falling apart before the reading is accomplished.

O. Gerlicz
Reading, Pa.

The perforated sheets were very nice, and it appears this new binding will be an even greater improvement.

H. F. Wagner, Supt.
Board of Public Works
Dowagiac, Mich.

While this page tore out better than those in toward the middle of the magazine, it didn't pan out too good either. . . . .

L. C. Lively
Gulf Power Co.

I like the perforated sheets better, but will be pleased with any tear-out feature suitable to everyone.

E. H. Pemberton
Southern Colorado Power Co

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February 1958

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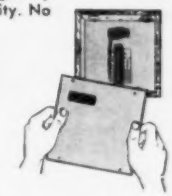
Features contributing to GTC's acceptance and reliability are:

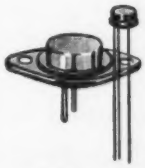
1. Provides swift and sure voice communication even in adverse environmental conditions, such as extremes of temperature and noise.

2. All amplifiers are "plug-in" contributing greatly to ease of installation and maintainability. No central equipment is required.



3. Long-life transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components are employed.

4. Inconvenience and expense of vacuum tube replacement is eliminated.



5. Design allows expansion of system from "very small" to "very large" by simple addition of units where required.

6. Ultra simple wiring plan (no shielded cables) and unitized equipment with integral terminal facilities make for easy low cost installation.

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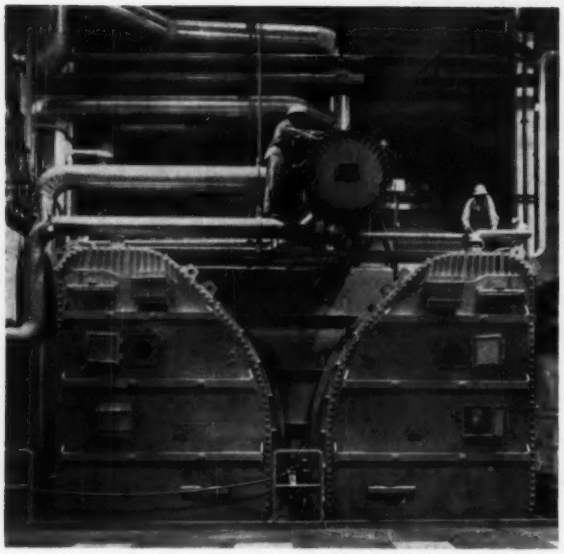

Condensers get 518-million gpd from . . .

Chamber that screens, pumps sea water as . . .

Los Angelenos View Scattergood Dedication

A number of Los Angeles' leading citizens last week attended ceremonies honoring the late Ezra F. Scattergood, for whom the city's Dept of Water & Power's new Scattergood Steam Plant is named. The visitors then saw and heard about the station's features, including the sea water cooling of the main condensers.

The cooling system is capable of circulating 518-million gpd—an amount more than the fresh water needs of the whole city—by means of an intake and an outlet tunnel, each with 12 ft dia. Water is drawn in a 1,953-ft tunnel to a chamber where solid material is screened.

Miss Elizabeth Scattergood, daughter of the system's first chief electrical engineer and general manager, unveiled a plaque in honor of her father. Officials of the department said that four new units will be added to the two now on the line, which are capable of generating 320 Mw. The later additions will boost plant capacity above 1,200 Mw.

The Powerscope

Another Watchdog Agency

In what may be the start of a national trend, the Pennsylvania legislature has before it a bill to establish a "Consumers Protection Agency" with the asserted purpose of guarding against excessive utility rates. The introduction of the bill follows by a few months the enactment of a similar measure in California.

For the Pennsylvania agency, an appropriation of $200,000 is recommended by the bill's sponsors. The state Department of Justice would direct the bureau while the attorney general would appoint and fix the pay of the staff.

If the trend continues, utility rate executives may find themselves faced with the job of not only meeting requirements of federal, state, and, sometimes, local regulatory bodies but of haggling with watchdog agencies as well. One remote palliative might evolve if an enlightened electorate ever succeeds in having agencies created to protect taxpayers who foot the bill for new agencies.

Relations in the Round

The theme of "Your Relations Are Showing" will encompass dealings with employees, supervisors, executives, customers and the public in the 12th annual round table conference of Edison Electric Institute's Industrial Relations Committee. The Sept. 21-23 session takes place at the Drake Hotel, Chicago. E. S. Evans, committee secretary, has urged that late starters send reservations to him at 750 3rd Ave, New York 17.

Heating 'Take Off' Nears

With the coming of competitive nuclear power plants, "which are not so far off as many say," electric heating is going to "take off," said Allen Van Wyck, Illinois Power Co president, at a recent New York Security Analysts meeting. IPC, a combination company, will be ready for it when the electric heating surge begins, he said.

The company now promotes it on a luxury basis. Costs for electricity now range from two-and-a-half to five times more than gas heating in the area, he stated.

Van Wyck said earnings for 12

(*Continued on page* 184)

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The Powerscope (*Continued from page 182*)

months ended July 31 were $2.44 per share on net income of $17,782,433 compared with $2.02 a share on a net of $15,064,873 for the like period in 1958. Earnings for the year ending Dec. 31 are estimated at $2.55 or higher, "depending on how long the steel strike lasts." IPC will increase the common stock dividend from the present $1.50, Van Wyck declared, "but I can't say when or how much."

Con Ed Drops 10¢ Service

In a move that promises to boost sales of postage stamps, Consolidated Edison Co of New York has stopped paying the 10¢ charge imposed by American Express offices, banks and savings and loan associations for handling a bill paid there by a customer of the utility. The customer now will pay the 10¢ himself unless he prefers to mail the bill or pay it at one of the 19 Con Ed district offices.

A Matter of Choice

Carolina Power & Light Co last month received authority to serve a 300-acre housing development northeast of Sumter, S. C., despite the objections of a cooperative which maintained that the CP&L extension would be an invasion of the co-op's territory.

In rejecting the petition of the Black River Electric Cooperative, the South Carolina Public Service Commission noted that the housing development firm had turned down the co-op's offer to serve the area, but had sought CP&L service instead. ". . . It would not be in the public interest to deny the correspondents (the developers) in this matter the right to choose the company with which they deal for electric service," the commission order said. To comply with the co-op's cease and desist petition would be unconstitutional, the order added.

In explaining why they chose CP&L, the developers said that the development area is likely to be annexed by Sumter and that the co-op is a voluntary, non-profit organization which may go into voluntary dissolution and leave the applicants without service.

These reasons are "valid and substantial, and cannot be lightly regarded," the PSC said.

Jury Indicts Bell

A Grant County, Wash., grand jury has indicted Frank T. Bell, former federal commissioner of fisheries and a long-time leader in Columbia Basin irrigation development. He is charged with five counts of perjury in connection with testimony in disbursement of funds to Glenn Smothers, who resigned as Grant County PUD manager when the jury's investigation of the PUD began last year.

Bell owns a farm in the county and a hotel in Ephrata, and has acted as consultant to the PUD. He posted $1,000 bond and was released. This is the first indictment issued by the jury.

Water Hearings Slated

The Senate Select Water Resources Committee has made these final changes in its fall field hearings:

Group One—Oct. 7, Bismarck, N. D.; Oct. 8, Laramie, Wyo.; Oct. 9, Billings, Mont.; Oct. 12, Missoula, Mont.; Oct. 13, Salt Lake City; Oct. 15, Sacramento, Calif.

Group Two—Oct. 26-27, towns still to be announced in South Dakota; Oct. 29, Detroit; Oct. 30, Philadelphia.

Group Three—Nov. 18, Topeka, Kan.; Nov. 19, Des Moines, Iowa; Nov. 20, Sante Fe, N. M.

Group Four—Nov. 30, Alexandria, La.; Dec. 2, Columbia, S. C.; Dec. 3, Jacksonville, Fla.; Dec. 7, Augusta, Maine; Dec. 8, Boston.

This list replaces two previous schedules released by the committee.

Load Control

Printer's Ink recently noted that the British government's Gas Board has equipped its new special training school with electric appliances. There isn't a single gas outlet on the premises.

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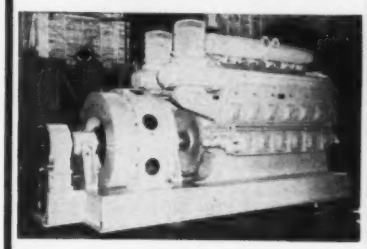

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The Meetings Calendar

SEPTEMBER

• **Edison Electric Institute**—Sales Division Executive Committee, Roosevelt Hotel, New York City, Sept. 21-22; Industrial Relations Committee Twelfth Annual Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 21-23.

Instrument Society of America—14th Annual Conference and Exhibit, International Amphitheatre, Chicago, Ill., Sept. 21-25.

National Electrical Manufacturers Association—Board of Governors, Hotel Biltmore, New York City, Sept. 22.

Third Industrial Nuclear Technology Conference—Sponsored by the Armour Research Foundation and Nucleonics magazine, Morrison Hotel, Chicago, Ill., Sept. 22-24.

Second Electric Utility Seminar—Sponsored by the System Planning Committee of the PEA, Penn State University, State College, Pa., Sept. 23-25.

Missouri Valley Electric Association—Accounting Conference, President Hotel, Kansas City, Mo., Sept. 24-25.

• **International Association of Electrical Inspectors**—Canadian Section, Montreal, Quebec, Canada, Sept. 25-26.

Northwest Electric Light & Power Association—Annual Meeting, Vancouver Hotel, Vancouver, B. C., Canada, Sept. 28-30.

National Power Conference—Sponsored by the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, Muehlebach Hotel, Kansas City, Mo., Sept. 27-30.

National Symposium on Telemetering—Sponsored by IRE, San Francisco, Calif., Sept. 28-30.

National Association of Corrosion Engineers—Western Region Conference, Bakersfield Inn, Bakersfield, Calif., Sept. 29-Oct. 1.

Pennsylvania Electric Association—Annual Meeting, Bellevue Stratford Hotel, Philadelphia, Pennsylvania, Sept. 30-Oct. 1.

Northwest Public Power Association—Accounting and Financing Workshop, Clark County PUD community room, Vancouver, Wash., Sept. 30-Oct. 1.

Canadian Electrical Manufacturers Association—15th Annual Meeting, Sheraton-Brook Hotel, Niagara Falls, Ontario, Canada, Sept. 30-Oct. 2.

OCTOBER

• **Pennsylvania Electric Association**—Meter Committee, Pittsburgh, Pa., Oct. 1-2; Electrical Equipment Committee, Pick-Roosevelt Hotel, Pittsburgh, Pa., Oct. 8-9; System Planning Committee, Galen Hall Hotel, Wernersville, Pa., Oct. 12-13; Prime Movers Committee, General Brodhead Hotel, Beaver Falls, Pa., Oct. 22-23; Relay Committee, Hotel Alexander, Hagerstown, Md., Oct. 29-30.

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